VOL. LIII, NO. 3, MARCH, 1958

THE Journal OF THE AMERICAN LEATHER CHEMISTS ASSOCIATION

PUBLISHED MONTHLY BY
THE AMERICAN LEATHER CHEMISTS ASSOCIATION
PUBLICATION OFFICE, EASTON, PA.

Reliable, Direct World-Wide Sources for

VEGETABLE TANNING MATERIALS

Consistent High Tannin...
Consistent Color...
Consistent Quality

Whatever your requirements, for VEGETABLE TANNING MATERIALS you can put your confidence in us as your prime and continuous source of supply. Prompt shipments.

PRODUCTS OF THE FORESTAL GROUP

QUEBRACHO EXTRACTS

"SUPERIOR" ORDINARY
"SUPERIOR" CLARIFIED
"SUPERIOR 350"

WATTLE EXTRACTS

"RHOMOSA" SOLID RHODESIAN

Exclusive Representations
PROTAN S. R. L. Buenos Aires, Argentina
RHODESIAN WATTLE COMPANY, LTD. Umtali, Southern Rhodesia
E. N. SOURLANGAS, LTD. Mitylene, Greece
GARVAMNES A. B. WEIBULL Landskrona, Sweden
WEIBULL (LONDON), England
WEIBULL (ARGENTINA) S. R. L. Buenos Aires, Argentina
WEIBULL S. A. R. L. Paris, France

World-wide
Buenos Aires
London • Paris
Landskrona
Bombay • Calcutta
Durban • Umtali
Mitylene • Palermo
Rio de Janeiro

Wattle Bark • Chestnut Extract • Valonea • Myrabolams • Myrabolam Extract • Mangrove Bark and Extract • Sumac • Divi Divi

The **OLSON** IMPORTING COMPANY Inc.

20 VESEY STREET, NEW YORK 7, N. Y.

Cable Address "Corosage"
Tel. WOrth 4-4084

The Journal

of the

AMERICAN LEATHER CHEMISTS ASSOCIATION

Vol. LIII MARCH 1958 No. 3

CONTENTS

Comparison of Various Methods for Determining the Water Vapor Permeability of Vegetable-Retanned Side Leather - - - - - - *By* M. Maeser 132

The Influence of Temperature upon the Uptake of Salt by Cattlehide during Brining - - - - - - - - - - - - - - *By* R. Hauck and R. M. Lollar 149

Effect of Chrome Tanning on the Structure and Wide-Angle X-Ray Pattern of Collagen - *By* M. S. Santhanam 162

Life Lines - - - - - - - - - - - - 169

ALCA News - - - - - - - - - - - - 170

Abstracts - - - - - - - - - - - - 178

Book Review - - - - - - - - - - - - 189

SUBSCRIPTION - - MEMBERS $12.00 A YEAR - - NONMEMBERS $15.00

Published Monthly by

The American Leather Chemists Association

Entered as Second-Class Matter at the Post Office, Easton, Pa.
Acceptance for mailing at special rate of postage as provided for in section 1103.
Act of October 3, 1917, authorized July 16, 1918

COPYRIGHT, 1958, THE AMERICAN LEATHER CHEMISTS ASSOCIATION

SPRUCE EXTRACT

POWDERED SUPER SPRUCE

LACTANX

■

Robeson Process Company

General Offices and Plant
ERIE, PA.

There's More-Much More

to choose from

Extracts and Raw Tanning Materials
From the Most Complete Line of Brands

QUEBRACHO

Ordinary	Clarified
Formosa	Bestsoubi
Granchaco	Horsehead
Guarani	Rex
Indio	Avion
Sastre	Sol Puma
F. A.	
La Galera	
Puma	

CHESTNUT

Progil S. A. — Lion's Head
Tanins Rey — Bull Head

WATTLE

S. African	E. African
H. E. C.	Rhino
N. C. S.	

★

SPECIAL SPRAY DRIED EXTRACTS

Dritan
R. W. D.
} Quebracho • Valonia • Myrabolams • Mangrove • Blends

Myrabolams, Divi-Divi, Mangrove, Valonia, Sumac and Other
Vegetable Tanning Materials from All Parts of the World.

TANIMEX CORP. — ELKAN-RIVER PLATE CORP.

27 William Street • New York 5, N. Y.

WHitehall 3-6300

To prevent SPOILAGE

USE.. BSM-11

as part of Good housekeeping practice

BSM-11 is highly effective in controlling the growth of microorganisms which digest hide substance during processing. BSM-11 is a liquid, thus easily added to the systems directly from the drums.

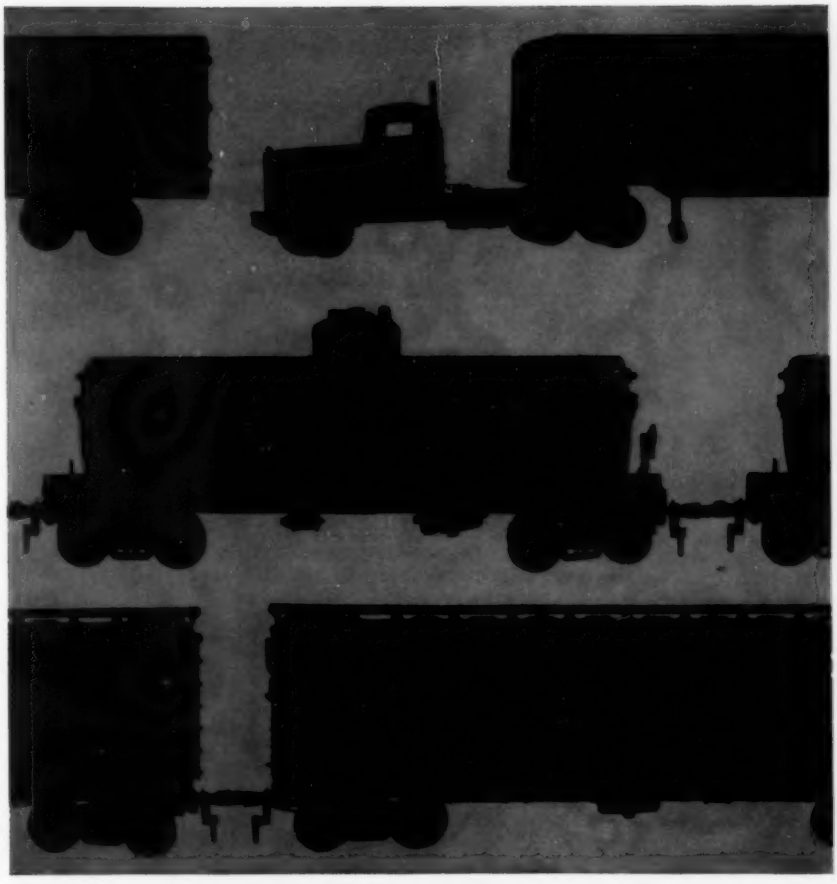
It has been demonstrated in many tanneries that the synergistic combination of bactericides and fungicides in BSM-11 provides efficient, economical control of bacteria, molds and yeasts which damage skins and hides.

Our representative will give technical assistance on the most effective use of BSM-11 in your process.

BUCKMAN LABORATORIES, INC.

Manufacturing Chemists • Memphis 8, Tennessee • Representatives in Most Countries

MICROORGANISM CONTROL SPECIALISTS



Diamond offers uniformity— shipment after shipment after shipment

That's why tanners who deal with DIAMOND are sure they get consistently dependable chemicals. Use these chemicals with uniform process controls—and you produce top-grade leather at lowest cost.

All DIAMOND chemicals, including those made for the leather industry—Tanolin®, fat liquors, bichromates or neutralizers—are accurately prepared by technicians trained in chemical quality control.

Profit now from DIAMOND consistency. We offer quick delivery from strategically located warehouse stocks, nine convenient sales offices, and helpful counsel from your nearby DIAMOND representative. He's skilled in leather chemistry and backed by DIAMOND's technical staff. DIAMOND ALKALI COMPANY, 300 Union Commerce Building, Cleveland 14, Ohio.

Diamond Chemicals

use
ARKO®
FAT LIQUORS
for finer leathers
ARKO BASE C
a superior suede oil—
produces soft, mellow
leather with a tight, round
feel, and well nourished nap
without excess sheen; does
not mark up when rubbed
ARKO FAT LIQUOR G P S
gives a tight, soft feel to white or light colored
leathers—garment sheep or side leathers;
soft shoe uppers and chrome linings
ARKO FAT LIQUOR L C
for a light, fluffy feel on white or light colored
glove, garment and soft shoe leathers
blend with Arko Fat Liquor GPS to produce
soft, clean leathers with tight, fine break
ARKO FAT LIQUOR L M
for colored cow, horse, sheep shoe or
garment leathers
rich blend of marine and cocoanut oils
with added moellon
excellent topping oil for rich colors
ARKO FAT LIQUOR M C A
fine topping for white or light colored leathers
excellent for shearlings
a white stable nonionic emulsion of marine and
neatsfoot oils; applied in the drum or tan paddle

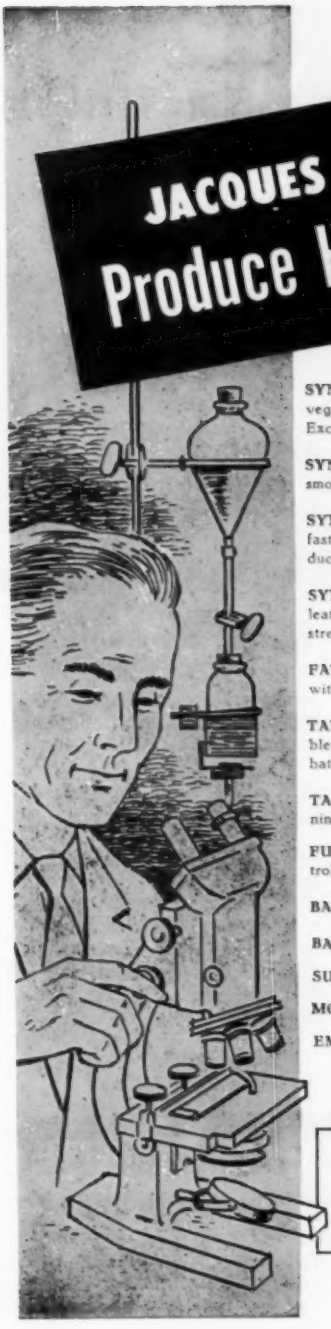
● WRITE FOR TECHNICAL SERVICE BULLETIN.

ARKANSAS CO., INC.

serving the tanning industry for over 50 years

NEWARK • NEW JERSEY

AC INC.



JACQUES WOLF CHEMICALS Produce High Grade Leather

SYNEKTAN 0-230*—For use alone or in combination tanning with vegetable extract or chrome. Useful for rapid tannages and bleaches. Excellent as a retan on chrome stock.

SYNEKTAN 0-272*—Similar to Synektan 0-230 in use. Produces smooth grain leather with mellow feel.

SYNEKTAN NPP*—For high grade white leather of improved light-fastness. Also used in combination with Alum, Chrome, and in producing pastel shades. Produces full, soft leather of good weight.

SYNEKTAN NCRP*—Recommended for Sport goods, Suede and Elk leathers. Produces full, plump, fine grained leather, of good tensile strength.

FAT LIQUORS—For all types of leather. Special quality fat liquors with high lubricant effects and excellent light fastness for whites.

TANASOL PW*—Syntan in beads, to use with Tanasol NCO for bleaching chrome stock and in retanning chrome stock. In the dye bath for good level colors.

TANASOL NCO*—Syntan in beads, to use with extracts in the tanning and retanning operations.

FUNGIZYME* BATES—Pancreatic bating salts of standard, controlled quality.

BATE A & AS—For sheep skins and sole leather.

BATE B & BS—For furniture leather, side leather and calf skins.

SULPHONATED OILS—(Various Bases.)

MONOPOLE OIL*—(For Finishing.)

EMULSIFIERS AND DETERGENTS—For good degreasing.

Samples and information upon request.

JACQUES WOLF & CO.
Chemicals PASSAIC, N.J.

Plants in: Clifton, N.J., Carlstadt, N.J., Los Angeles, Calif.

* Reg. U. S. Pat Office.

New PRIMAL finish

adds that quality touch!

Newly-developed Rohm & Haas PRIMAL white finish is particularly excellent for the quality finishing of smooth white side leather for shoes and handbags.

This PRIMAL white finish contains a special new pigment grind as well as new binders. The advantages of using PRIMAL white finish for shoe and handbag leather are important, for PRIMAL white finish provides

- Better flexibility
- Greater resistance to washing—without the use of lacquers
- Excellent flow-out—it spreads easily sideways with virtually no streaking
- Good coverage or hiding power—usually requires fewer coats

It may pay you to investigate this new PRIMAL white finish for your particular needs. For further information about PRIMAL white finish and other leather chemicals and services, simply write to Leather Chemicals Department or get in touch with your Rohm & Haas representative.

Chemicals for Industry

ROHM & HAAS COMPANY

WASHINGTON SQUARE, PHILADELPHIA 5, PA.

Representatives in principal foreign countries

PRIMAL *is a trade-mark, Reg. U.S. Pat. Off. and in principal foreign countries.*

Consult

RESEARCH *and* **TECHNICAL DEVELOPMENT SERVICE**

about your

Tanning, Dyeing, Processing

and **Finishing** *problems*

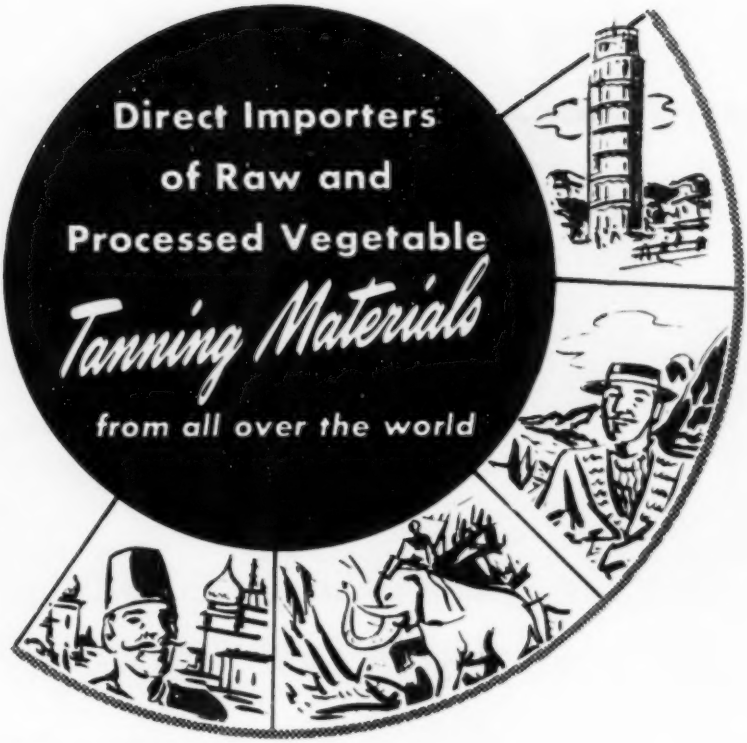
Geigy products are carried in all important tanning centers

GEIGY DYESTUFFS *division of Geigy Chemical Corporation*
Saw Mill River Road, Ardsley, New York

200 years Geigy

BRANCH OFFICES: *New England: Newton Upper Falls, Mass. Charlotte, N. C. • Chattanooga • Chicago • Los Angeles Philadelphia • Portland, Ore. • Toronto*
In Great Britain: *The Geigy Co., Ltd., Manchester*

Direct Importers
of Raw and
Processed Vegetable
Tanning Materials
from all over the world



We offer:

the following Raw Materials:

- Wattle Bark
- Valonia Cups and Beards
- Myrabolams
- Mangrove Bark
- Divi Divi
- Sumac

and Extracts: (*solid and spray-dried*)

- Quebracho
- Chestnut
- Wattle
- Valonia
- Myrabolam
- Mangrove
- Sumac

Whatever your needs . . . you can depend on Barkey!

BARKEY is known for prompt shipments direct from foreign ports to any port in the United States or Canada . . . in any quantity to meet your need.

Barkey Importing Co., Inc.

44 EAST 53RD STREET • NEW YORK 22, N. Y.

How to control alkalinity in unhairing solutions

Here's one really effective way to protect your hides and skins from too much alkalinity in unhairing solutions:

Maintain precise and separate control over the sulfide and the alkali in your solutions.

You get such control *built-in* with Hooker sodium sulfhydrate. Six pounds of flake sulfhydrate give you the same sulfidity as *ten* pounds of flake sodium sulfide—but only *half as much* alkalinity.

By switching to sodium sulfhydrate, you save on handling and storage. You actually use 40% less material.

The flakes dissolve rapidly into clear, sediment-free solutions you can use at once.

Many tanners are getting greater yields of cleaner, better-grained leather with Hooker sodium sulfhydrate. For more details on sodium sulfhydrate unhairing, write for Hooker Bulletin 500 and 508.

HOOKER ELECTROCHEMICAL COMPANY
903 UNION STREET, NIAGARA FALLS, N. Y.

HOOKER CHEMICALS PLASTICS

DUREZ® PLASTICS DIVISION
NIALK® CHEMICALS
OLDBURY® CHEMICALS

Sales Offices: Chicago; Detroit; Los Angeles; New York; Niagara Falls; Philadelphia; Tacoma; North Tonawanda, N. Y.; Worcester, Mass. *In Canada:* Hooker Chemicals Limited, North Vancouver, B. C.

famous

TANNERY

"HOUSEHOLD NAMES"

Every industry has its famous names. In tanning, Atlas, and the products it has developed through the years, all are "household names"—respected because they represent the finest of their kind and for their purposes.

How many of those names do you recognize as "old friends?" How many of the new ones are you familiar with?

Atlas, keeping apace of, and frequently leading the way to, new progress in tanning, brings you the products best suited to your needs.

It is a fact that when tanners change to Atlas Fatliquors, few ever change again.

Atlas **REFINERY, INC.**
142 LOCKWOOD STREET
NEWARK 5, N. J.

STYLIZING
LEATHER WITH
CALCO® DYES
AND CHEMICALS

Calcomine*Scarlet B
Calcomine Scarlet 3B

YOUR BEST BUY FOR: Economy · Levelness Uniformity · Fullness of Shade · Clarity of Shade

For all these qualities, specify Calcomine Scarlet B and Calcomine Scarlet 3B. These companion dyes are ideal for producing low-cost, level, uniform, full-surface scarlet shades on side, calf, split, kid, suede, and garment leathers.

For further information, consult your Cyanamid Dyes representative.

Calco®
Symbol for Quality Dyes

*Trademark

CYANAMID

AMERICAN CYANAMID COMPANY
DYES DEPARTMENT
BOUND BROOK, N. J.

NEW YORK • CHICAGO • BOSTON • PHILADELPHIA • CHARLOTTE • PROVIDENCE • ATLANTA • LOS ANGELES • PORTLAND, OREGON

NORTH AMERICAN CYANAMID LIMITED, DYES DEPARTMENT, MONTREAL AND TORONTO

ONE OF AMERICA'S FOREMOST IMPORTERS, PROCESSORS and MANUFACTURERS OF

Tanning and Dyewood Extracts

88 YEARS
1869-1957

OF SERVICE TO TANNERS

There is real economy and a world of satisfaction when the J. S. Young Co. is your supplier. "Eighty-eight Years Young", our facilities and our services to the tanning industry have expanded continuously. Our plants have grown in capacity, flexibility and in efficiency.

The J. S. Young Co., importers, manufacturers and processors, is in a position to supply tanners with practically every known reputable dyewood and tanning extract—from every part of the world.

Deliveries are made as ordered, when ordered—in any quantity from a barrel to a tank car or tank truck. Shipments can be made direct from Baltimore, or from our warehouses in Peabody, Mass., or Chicago.

The J. S. Young Co. is your stable, dependable, source of supply.

Manufacturers of the famous Chembark Natural tanning extracts for the Chemtan Co. and other special products.

THE J. S. YOUNG CO. 10½ ACRE PLANT LOCATED IN BALTIMORE ON DEEP WATER

LOGWOOD
FROM HAITI
WATTLE BARK
FROM EAST AND SOUTH AFRICA
GAMBIER
FROM MALAYAN STRAITS
MYRABOLAM
FROM INDIA
QUERBRACHO
FROM THE ARGENTINE
CHESTNUTWOOD EXTRACT
FROM FRANCE AND ITALY
SUMAC
FROM SICILY
DIVI-DIVI
FROM SANTA DOMINGO
HEMLOCK
FROM ASIA
FUSTIC DYEWOOD
FROM CENTRAL AMERICA
HYPERNIC
FROM NICARAGUA
OSAGE ORANGE
FROM TEXAS
HEMATINE
FROM HAITI
TANNIC ACID
FROM TURKEY

The **J. S. YOUNG CO.**

2701-2755 Boston St., Baltimore 24, Maryland

Experienced technical advice available on request from Baltimore or any of our branches:

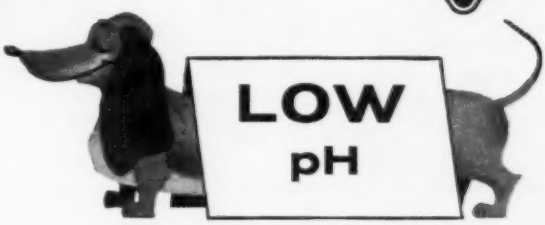
PHILADELPHIA • DANVERS, MASS. • PEABODY, MASS. • NEW YORK • CHICAGO • MILWAUKEE

For best results —neutralize with

SOLVAY AMMONIUM BICARBONATE

You can improve the color, texture and grain in *all* your chrome-tanned leathers . . . solids, pastels and whites . . . when you neutralize with SOLVAY Ammonium Bicarbonate. Mild yet efficient with a low pH of only 7.8, it penetrates the leather deeply with a high neutralizing action that is so necessary to the production of top quality leather. Economical to use in 1½% solution . . . economical to buy in 100-lb. vapor barrier bags.

SOLVAY ®



OTHER PRODUCTS FOR TANNERS

Solvay Cleansing Soda X
Mutual Koreon M and X
Solvay Cleansing Soda XX
Mutual Sodium Bichromate
Solvay Snowflake® Crystals
Mutual Potassium Bichromate

SOLVAY PROCESS DIVISION

Allied Chemical

ALLIED CHEMICAL & DYE CORPORATION
61 Broadway, New York 6, N. Y.

BRANCH SALES OFFICES

Boston • Charlotte • Chicago • Cincinnati • Cleveland • Detroit • Houston
New Orleans • New York • Philadelphia • Pittsburgh • St. Louis • Syracuse

Soda Ash • Snowflake® Crystals • Potassium Carbonate • Ortho-dichlorobenzene • Ammonium Bicarbonate
Calcium Chloride • Sodium Bicarbonate • Cleaning Compounds • Caustic Potash • Mutual Chromium Chemicals
Methyl Chloride • Monochlorobenzene • Chloroform • Sodium Nitrite • Chlorine • Para-dichlorobenzene
Vinyl Chloride • Ammonium Chloride • Aluminum Chloride • Carbon Tetrachloride • Methylene Chloride
Caustic Soda • Hydrogen Peroxide

Using Salt Efficiently

by **INTERNATIONAL SALT COMPANY, INC.**

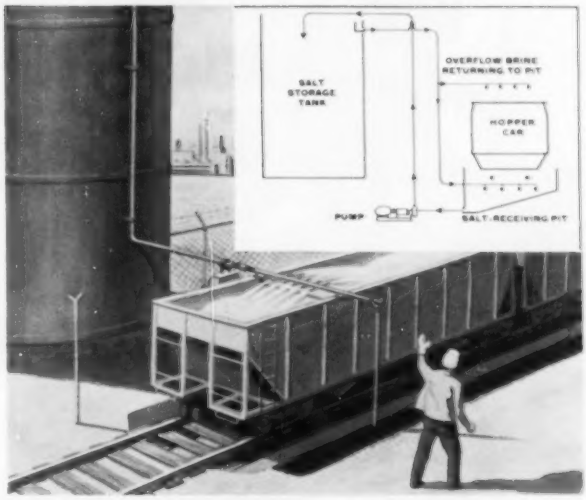
Hydraulic Handling -- Quick, Economical Way to Move Salt into Storage

Here's a new, effective method for moving salt from delivery cars or trucks into plant storage. Hydraulic Handling systems, already in operation in industry, have eliminated the expense of mechanical unloading equipment, and cut down considerably on man-hours needed to do the job.

What is Hydraulic Handling? Very simply, Hydraulic Handling is the movement of granular salt in circulating saturated brine, through pipes. Referring to the diagram, you will note that dry salt from the hopper car is mixed with saturated brine and undissolved salt. This slurry is pumped through a pipe to a salt-storage tank. Overflow brine from the tank continuously returns to the slurrying pit to carry more salt into storage.

Advantages of Hydraulic Handling

1. **Great flexibility.** Because *pipes* carry salt, a Hydraulic Handling system can be installed where it won't interfere with other plant activities.



POSSIBLE HYDRAULIC HANDLING INSTALLATION

Rock salt in hopper car is flushed into salt-receiving pit by brine returning from storage tank. Slurry of salt and brine is pumped continuously into the tank.

2. **No need to move existing equipment.** Plant operating equipment that might obstruct mechanical handling devices simply doesn't get in the way of a Hydraulic Handling installation.

3. **Long life, low maintenance.** You need no safety guards . . . no roofing to protect salt from weather . . . no belt conveyors, elevators, or similar pieces of mechanical handling equipment. Also, there is never any salt dust that might corrode vital plant equipment.

4. **Unlimited capacity.** Hydraulic Handling systems can be designed to unload, move, and store any amount and type of salt — rock or evaporated. Whatever your specific unloading needs. Hydraulic Handling can satisfy them.

You can get more information from International Salt Company on how Hydraulic Handling can work in your tannery to cut down salt-unloading and salt-handling expense. One of our experienced sales engineers will be glad to work with you to determine the best system of Hydraulic Handling for your specific needs. He can also help you get maximum efficiency from the salt or brine you use. Ask him . . . send a card or letter to International Salt Company, Inc., Scranton 2, Pa. . . . or contact our nearest district office.

SALES OFFICES: Atlanta, Ga.; Chicago, Ill.; New Orleans, La.; Baltimore, Md.; Boston, Mass.; Detroit, Mich.; St. Louis, Mo.; Newark, N. J.; Buffalo, N. Y.; New York, N. Y.; Cincinnati, O.; Cleveland, O.; Philadelphia, Pa.; Pittsburgh, Pa.; Memphis, Tenn.; and Richmond, Va.

Service and research are the extras in STERLING SALT

PRODUCT OF INTERNATIONAL SALT COMPANY, INC.

Emulsifiers

for the Leather Industry for Hide Degreasing Chrome Tanning Fatliquoring

Antaron. FC-34

Emulphor. EL-620, EL-719, ON-870, VN-430

Emulphogene. AM-870

Igepal. CO-530, CO-630, DM-710

Katapol. PN-430

Antara offers to the leather industry a wide range of anionic, nonionic and cationic surfactants to emulsify various oils, fats, and waxes.

TYPICAL APPLICATIONS INCLUDE:

PICKLE DEGREASING OF HIDES
—to provide a powerful emulsifying action;

CHROME TANNING
—to promote uniform takeup of chrome, thereby overcoming subsequent "window framing";

FATLIQUORING
—to control the stability, softening effect, lubrication, and penetrating characteristics of fatliquor formulations.

KATAPOL PN-430

is a new cationic emulsifier which provides maximum retention properties to fatliquors; it is soluble in a variety of animal, vegetable, and mineral oils.

For full information on the Antara emulsifier that will do the best job for you, call or write our nearest branch office.

From Research to Reality

ANTARA CHEMICALS
A SALES DIVISION OF
GENERAL ANILINE & FILM CORPORATION
435 HUDSON STREET · NEW YORK 14, NEW YORK

SALES OFFICES: New York • Boston • Providence • Philadelphia • Charlotte • Chattanooga • Chicago
Portland, Ore. • San Francisco • Los Angeles. IN CANADA: Chemical Developments of Canada, Ltd., Montreal

Maintains temperature constant within ±0.05°C
using a 12 x 12-inch bath

9935-A.

TECHNE "TEMPUNIT" (Patented) CONSTANT TEMPERATURE CONTROLLER

SELF CONTAINED
...thermoregulator, heating unit, stirrer, and circulating pump in one unit

A self-contained unit incorporating all components required for maintaining open water baths at temperatures up to approximately 90°C, and for circulating water to external apparatus at a rate of 1¼ quarts per minute at 1½ ft. head.

The unique indicating thermoregulator system, with pneumatically actuated switch for control of heater, has the sensitivity of electrical contact methods but with greater dependability and longer life. Can be preset at any desired temperature 0 to approx. 90°C. Maintains temperature constant within ±0.05°C in a 4-gallon cylindrical glass vessel, 12 × 12 inches, without insulation.

Control housing, 6¾ inches wide × 4⅝ inches deep × 5½ inches high, contains stirring motor, thermoregulator with temperature indicator dial graduated from 15 to 95°C and pilot lamp, and has built-on clamp for attachment to vessels with wall thickness up to 1¼ inches.

The helical, bimetallic sensing element, stirrer, aspirator tube and 1000-watt tubular immersion heater are integrally attached beneath the housing. Heater is wound in a coil which encircles the six-blade propeller of stirrer and tip of aspirator tube.

Stirring motor, 1/20 h.p., is fan cooled, induction type, with self-lubricating bearings, suitable for continuous use. Immersed parts, with exception of bimetallic helix, are nickel plated. Housing is finished with glossy, green hammered effect.

Overall dimensions 6¾ inches wide × 7 inches deep × 11½ inches high. Tubulation for connection of pump to external apparatus is ⅜-inch outside diameter.

9935. Constant Temperature Bath Controller, Techne "Tempunit" (Patented), as above described, complete with 4-ft., 3-wire connecting cord with 2-prong, parallel blade attachment plug cap, and directions for use. Power consumption 1040 watts. For use on 115 volts, 50 or 60 cycles, a.c. Without bath **135.00**

9935-A. Ditto, complete with bath consisting of cylindrical jar of Pyrex brand glass, 16 inches diameter × 12 inches high, capacity 8½ gallons..... **178.59**

A.H.T.CO.

ARTHUR H. THOMAS COMPANY

More and more laboratories rely on Thomas / Laboratory Apparatus and Reagents

VINE ST. AT 3RD • PHILADELPHIA 5, PA.

JOURNAL OF THE
AMERICAN LEATHER CHEMISTS ASSOCIATION

Vol. LIII MARCH 1958 No. 3

DR. HENRY B. MERRILL - - - - - - - - - - - - *Editor-in-Chief*
B. D. Eisendrath Tanning Co., Racine, Wisconsin

DR. THOMAS C. THORSTENSEN - - - - - - - - - - *Associate Editor*
Lowell Technological Institute Research Foundation, Lowell, Massachusetts

EARL J. WATT - - - - - - - - - - - - - - - *Managing Editor*
Lowell Technological Institute, Lowell, Massachusetts

EDITORIAL BOARD

E. D. Compton, Eagle-Ottawa Leather Company
J. H. Highberger, United Shoe Machinery Corporation
Joseph R. Kanagy, National Bureau of Standards
Mieth Maeser, United Shoe Machinery Corporation
William T. Roddy, Tanners' Council Research Laboratory
Carl G. Telander, Raser Tanning Company
Thomas C. Thorstensen, Lowell Technological Institute Research Foundation
H. G. Turley, Rohm & Haas Company
Ralph H. Twining, L. H. Lincoln & Son, Inc.
C. David Wilson, Fred Rueping Leather Company
Wallace Windus, Eastern Utilization Research and Development Division, United States Department of Agriculture

ABSTRACTERS

Jose Behar B.
Margam G. Behar
Theodore D. Braunschweig
G. A. Bravo
James M. Cassel
Ira D. Clarke
Jerome Jansing
Henri Krakowski
Robert M. Lollar
Liboslav Masner
Ralph H. Twining
J. F. Wagoner
Harry R. Wilson

All manuscripts should be sent to the Editor-in-Chief, 1012 College Avenue, Racine, Wisconsin.

Mail in reference to subscription, advertising, and other business should be addressed to the Secretary-Treasurer of the Association. Checks should be made payable to the American Leather Chemists Association.

General correspondence concerning the *Journal* should be mailed to the Managing Editor.

Subscriptions—$12 per year for members; $15 for nonmembers.

COMPARISON OF VARIOUS METHODS FOR DETERMINING THE WATER VAPOR PERMEABILITY OF VEGETABLE-RETANNED SIDE LEATHER

MIETH MAESER

United Shoe Machinery Corporation
Beverly, Massachusetts

ABSTRACT

The water vapor permeability of four lots of vegetable-retanned side leather varying only in grease content was measured by six different methods and by several modifications of two of the methods. The results show that all methods and modifications except the resistance method of Goodings (8) rate the four lots of leather in the same qualitative order. The quantitative variations in the results obtained by different methods are quite high.

—×—×—

INTRODUCTION

Many methods have been devised for determining the water vapor permeability of sheet materials. The A.S.T.M. recognizes three such methods: one for determining the property in paper (1) and two for plastics (2). T.A.P.P.I. (3) has a standard method for paper. The Federal Specifications Board (4) and the A.L.C.A. (5) specify the same method for leather.

Literature on the subject of water vapor permeability gives only meager data on the correlation among the various methods. Fourt and Harris (6) showed that good correlation existed between the absorption method of the Federal Specifications and A.L.C.A. and the evaporation methods of the A.S.T.M. and T.A.P.P.I. for a large number of fabrics. The Institute of Paper Chemistry (7) has done much work on the subject, both in developing new methods and evaluating those already in use.

Work on the water vapor permeability of leather was summarized by Hobbs (9) at the time the Physical Testing Committee was developing a method for the A.L.C.A. The method suggested by Hobbs was adopted by the Association as official, but later research by Kanagy (10) indicated that better results were obtained by using a modified method. This new method was adopted as an Official Method of the A.L.C.A. in 1956.

Very little work has been published which shows the variations which are obtained in the measured values of the water vapor permeability when determined on the same pieces of leather by different methods.

TEST SPECIMENS

Forty sides of vegetable-retanned side leather were prepared for this and other tests. The sides were all selected before tanning to be as near the same size, weight, and quality as possible. The same tanning procedure was used on all sides except where different procedures were necessary to put the desired grease content into the leather. The sides were fatliquored or stuffed to give 4 lots of 10 sides with average grease contents as noted below.

A piece of leather 6″ x 6″ was cut from the bend of each side. A 3½″-diameter disc was cut from each piece. The disc was used for a water vapor permeability specimen. The remainder of the piece was used in the determination of the grease content.

The water vapor permeability of each of the 40 specimens was determined by Method A. The average of the 10 pieces from each lot was determined, and the individual specimen which had a water vapor permeability most nearly equal to that of the average for the lot was selected to be used as the test specimen in all other tests.

The grease content of each of the 10 specimens of each lot and the average for each lot were determined. It was interesting that the specimen which was closest to the average in water vapor permeability was also very close to the average in grease content.

After completion of all testing by Method A, a 2″-diameter disc was cut from the 3½″-diameter disc which was selected as representative of the average of each lot. These four 2″-diameter specimens were used in all other tests except the tests of Method E_2 which required seven specimens from each lot.

It should be emphasized that except for Test Method A, where all 40 specimens were tested, and Method E_2, where tests on 7 specimens from each of the 4 lots were required, all the data given in this paper were obtained on the same 4 pieces of leather. These pieces are designated throughout this report as follows:

Specimen	*Grease Content on Dry-Leather Weight (%)*
No. 1	3.9
No. 2	14.8
No. 3	18.1
No. 4	35.2

PROCEDURES

General.—In all methods except Method A the test assembly was as shown in drawing B, Fig. 4, in which **1** is a container with a ground top; **2** is a brass ring, hot-coated on the lip which sits on the container and on the lip where the specimen sits with a 50% mixture of beeswax and rosin; **3** is a brass ring with an inside diameter equal to the inside diameter of the container and coated with the beeswax and rosin mixture, and **4** is the specimen.

The specimen **4** was placed in ring **2** and the ring **3** was put in place. The whole assembly was warmed until the wax-rosin mixture melted, sealing the specimen to the rings.

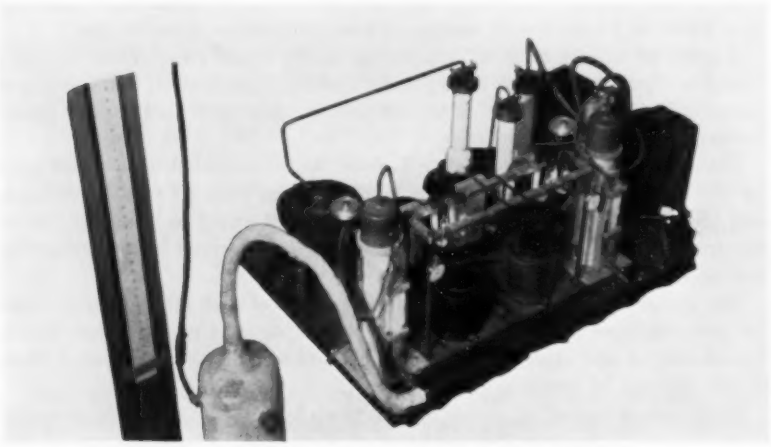


FIGURE 1.—Test assembly, Method A.

The container was filled to the proper depth with either water or desiccant as desired and the specimen assembly placed on the container and given a slight twist under pressure to form a seal.

In all tests the first 24 hours were used to allow the specimen to attain equilibrium. The specimen and ring assembly were then removed from the container, the container was refilled, the specimen assembly was replaced, and the cell was weighed. After an additional 24 hours the cell was reweighed and the loss or gain in weight determined. The specimen assembly was again removed, the container was refilled, the specimen assembly was replaced, and the cell was weighed again. This process was repeated until three successive losses were obtained which varied by less than 1%.

Method A.—The apparatus and the procedure used in this method were developed by the author. No published references to the use of similar ap-

paratus or procedure was found. The unique feature of the method is that a means is provided by which air of any humidity and in any reasonable quantity can be applied to either side of the specimen. Fig. 1 is a photograph of the apparatus used in this method. Fig. 2 is a line drawing to show more clearly the way the apparatus works.

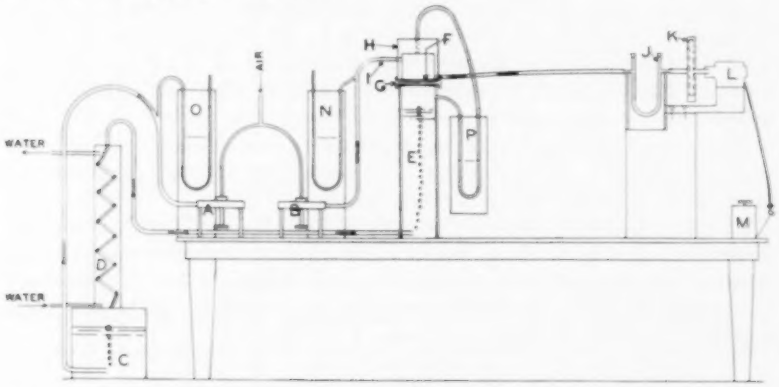


FIGURE 2.—Test assembly, Method A (schematic drawing). For meaning of letters, see text.

Air from any pressure source is conditioned to the relative humidity desired on the dry side of the diaphragm. The conditioner is not shown in Fig. 2. The conditioned air is split into two fractions and led to two pressure regulators, *A* and *B*. The air from regulator *A* is led to the bottom of a heated water bath *C* where it is humidified at a relatively high temperature. From *C* the air is conducted through a condenser *D* where it is cooled to any desired temperature. The air, at 100% relative humidity and the temperature of *D*, is led to the tower *E* where it is reheated to the desired temperature and delivered to the bottom side of the specimen *F* which is held in ring *G*. Ring *G* is supported on tower *E* on 3 pins and is held away from the outer circumference of the tower by 3 pins. This precaution insures that the air has a free passage to the atmosphere in all directions. By this method air at any desired humidity and in any desired volume can be delivered to the bottom of the Specimen *F*.

The air which leaves the pressure regulator *B* is delivered into cylinder *H* through an orifice in the tube *I*. The cylinder *H* is cemented to the diaphragm with waterproof cement or with wax and rosin. The incoming air enters cylinder *H* with the stream tangent to the wall of the cylinder. This causes a whirl in the cylinder and gives a velocity to the air over the specimen. By changing the pressure of the air at *B* and the size of the orifice at *I*, the volume and velocity of the air which passes over the specimen can be separately varied.

The air is taken from cylinder *H* through a tube ⅛" above the specimen surface and carried to U-tube *J* which is filled with a desiccant for collecting the water out of the air. To eliminate any back pressure in cylinder *H* which would cause air to pass through the diaphragm from top to bottom and upset the moisture transmission, the air from the U-tube *J* is led to a fan *K* driven by motor *L*. The speed of the motor, and thus the pull of the fan, can be regulated by adjusting the voltage with the Variac *M*. In this way the air in cylinder *H* can be kept at atmospheric pressure, and no air can pass the diaphragm. Parts *N* and *O* are manometers to indicate when the air pressure in cylinder *H* is equal to the pressure in *E*.

This method is particularly easy to use when low velocities and volumes of air are used and when saturated air is used on the wet side and desiccated air is used on the dry side of the diaphragm.

Each of the 40 test specimens was tested by this method with an air flow of 10 cu. ft/hr on both sides of the specimen. The 10 specimens of each grease content were averaged; the averages are given in Table I, line 1. The single specimen from each group which was closest to the average of the group was selected for use in all subsequent tests.

TABLE I

WATER VAPOR PERMEABILITIES OF VEGETABLE-RETANNED SIDE LEATHERS

Method	Spec. #1		Spec. #2		Spec. #3		Spec. #4	
	Water Vapor Permeability	Spec. / #1	Water Vapor Permeability	Spec. / #1	Water Vapor Permeability	Spec. / #1	Water Vapor Permeability	Spec. / #1
A	133	1	100	0.760	60	0.460	12	0.091
B	153	1	118	0.771	61	0.398	22	0.143
C	203	1	179	0.887	104	0.515	37	0.184
D	193	1	149	0.775	115	0.598	26	0.135
E_1	126	1	95	0.755	67	0.530	28	0.222
E_2	2.35cm.		2.90cm.		4.47cm.		2.95cm.	
F	272	1	254	0.935	250	0.920	140	0.505

Water vapor permeability = water vapor transmission in grams/sq. meter/day.

$\frac{\text{Spec.}}{\#1}$ = the ratio of the water vapor permeability of a given specimen to that of specimen #1 when determined by the same method.

E_2—Values given are resistances of the diaphragms expressed as equivalent centimeters of still air.

Effect of rate of air flow.—To determine the effect of the rate of air flow over the specimen the apparatus of Method A and the four 3½" discs which were selected to represent the average for each group were used with 10 cu. ft/hr of air at 73°F. and 100% relative humidity on the wet side of the diaphragm. Air at 73°F. dried over calcium chloride was passed over the dry

side of the diaphragm at each of the flow rates shown on the abscissa of Fig. 3 where the results are plotted.

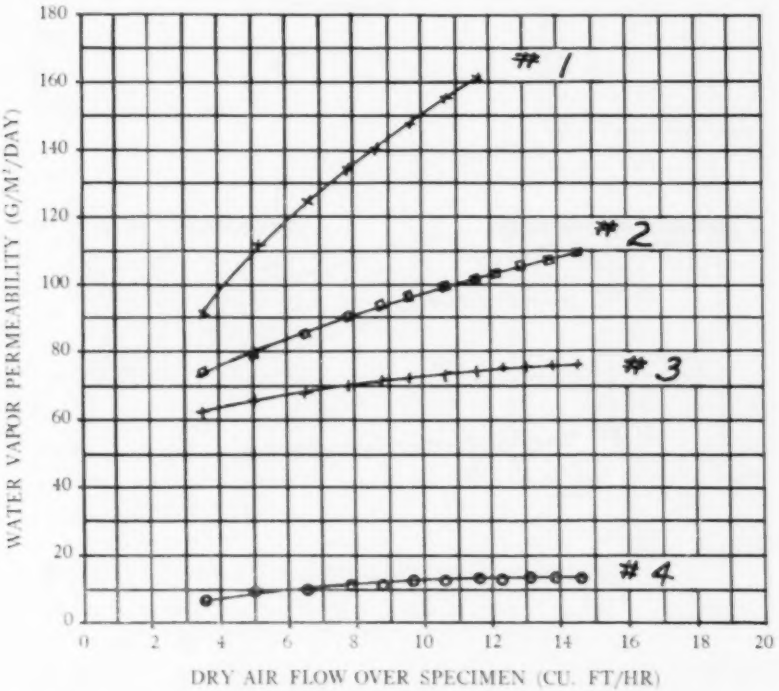


FIGURE 3.—Effect of rate of air flow over the specimen on the water vapor permeability, determined by Method A.

Method B.—This is the common evaporation method used by the A.S.T.M. and T.A.P.P.I. (1,3). The setup of the apparatus is shown in Fig. 4B. The container is filled with water to 1 cm. below the top, and the specimen assembly is placed on the cup. An empty cell and the 4 test cells were placed in the tunnel of Fig. 5. Dried air was introduced into the tunnel at the left and exhausted at the right. Tests were run with the specimens in different locations to check any possible change in the water vapor permeability due to position in the tunnel. No such differences were found. The amount of air introduced into the tunnel was varied between 6 and 14 cu. ft/hr. The values obtained with an air flow of 6 cu. ft/hr are given in Table I, and all the results are plotted in Fig. 6.

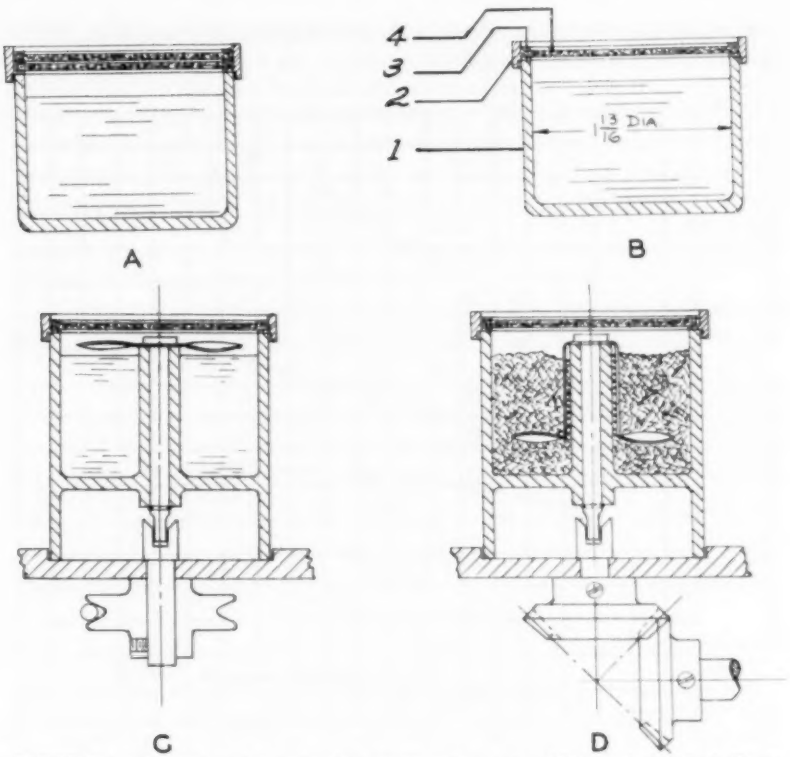


FIGURE 4.—Apparatus for measuring water vapor permeability. *A*, Method E; *B*, Methods B, E, and F (see text for meaning of numerals); *C*, Method C; *D*, Method D.

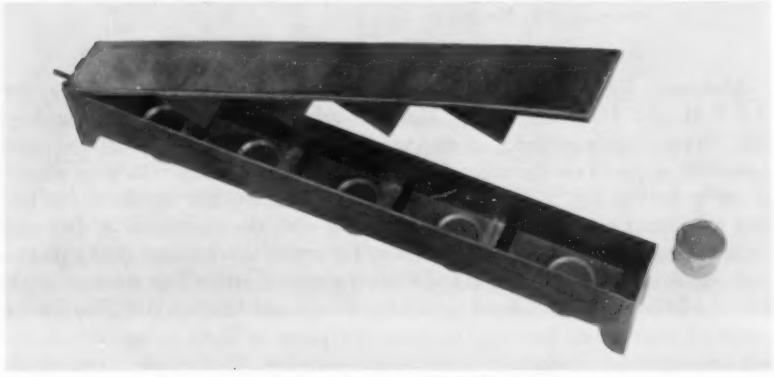


FIGURE 5.—Dry-air tunnel, Method B.

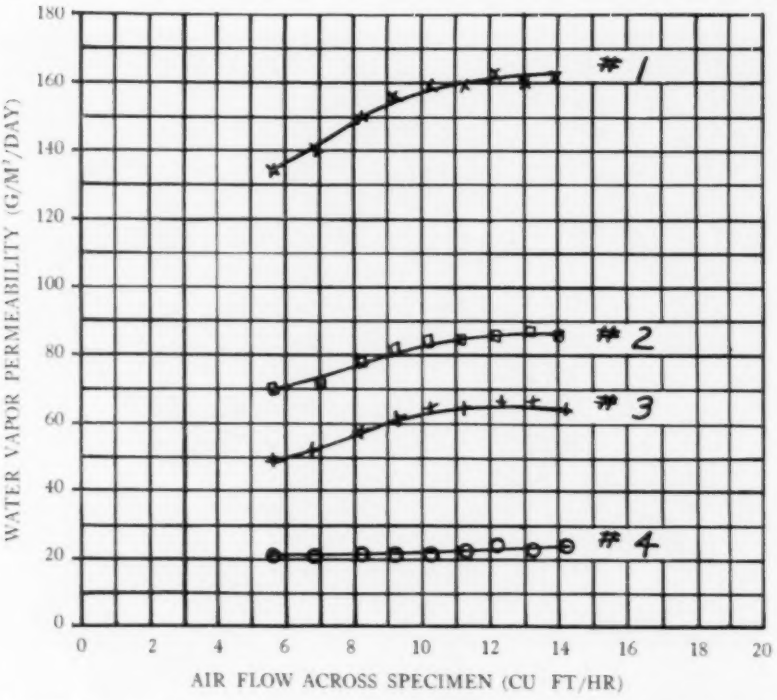


FIGURE 6.—Effect of changing the rate of flow of dry air over the specimen on the water vapor permeability, determined by Method B.

Method C.—The construction of the test cell used in this method is illustrated in Fig. 4C. The unique feature of this method is that the air between the specimen and the water level is constantly stirred. The test setup is shown in Fig. 7. A dish with the specimen and ring removed is shown on the left. A complete test cell is shown in the center, and at the right is a spot where a third cell can be placed.

The test was started with the water level 1 cm. below the specimen. The stirring fan between the water level and the specimen was run at 50 r.p.m. so that, while the air was stirred, the velocity pressure of the air was too low to upset the distribution of moisture to the diaphragm.

The drive shaft was packed with cup grease to eliminate loss of water vapor along it. When checks were run with aluminum foil in place of the specimen, no water was lost.

The cells were placed under a bell jar, as shown, and 6 cu. ft. of air per hour at 73°F., dried over calcium chloride, was introduced into the jar.

The data obtained on the 4 specimens by this method are given in Table I.

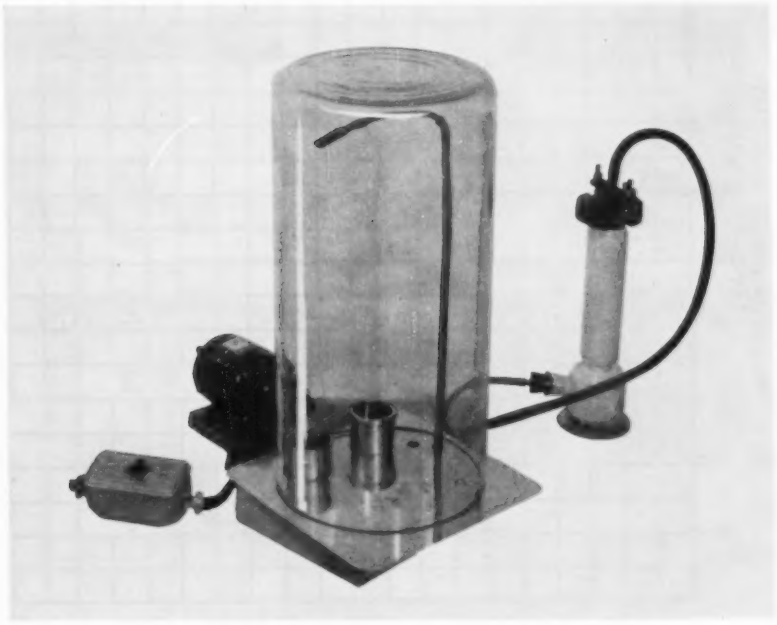


FIGURE 7.—Assembled apparatus for Method C.

Method D.—In this method a specimen is placed over a dish filled to 1 cm. from the top with calcium chloride which is constantly stirred. This keeps the air between the specimen and the desiccant stirred up and breaks up any wet surface which would otherwise develop on top of the desiccant.

The setup for this method is shown in Fig. 8, where two complete cells and one dish with the specimen removed are shown. The setup of the test cell is shown in detail in Fig. 4D. The stirrer turned at 2 r.p.m. Air at 73°F., humidified to 100% relative humidity in the condenser system shown in Fig. 8, was introduced into the bell jar at the rate of 6 cu. ft./hr.

The shaft of the stirrer in the cell was packed with cup grease to eliminate transmission of moisture along it. Check runs with aluminum foil in place of the specimen showed no change in weight in 72 hours. The data for the 4 specimens obtained by this method are given in Table I.

Method E.—This method is based on determining the resistance of a leather diaphragm as compared to the resistance of still air to the movement of water vapor. The method was used by Goodings (8) in his work on textiles.

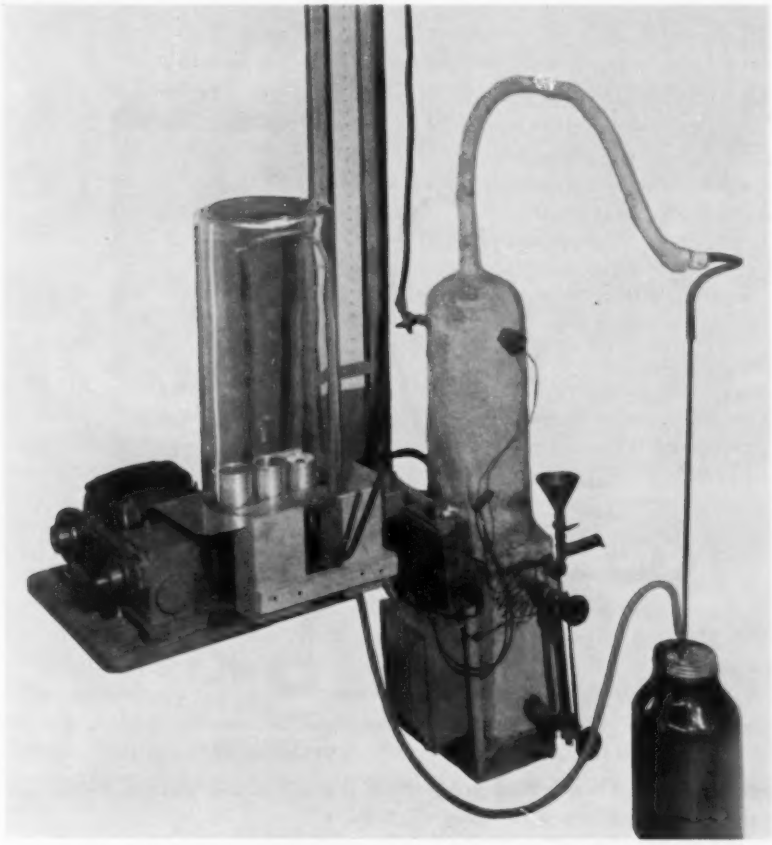


FIGURE 8.—Assembled apparatus for Method D and Method F.

The test cells used in this test are illustrated in Fig. 4. For each grease content 3 single-diaphragm cells (Fig. 4B) with the initial water levels 1, 1.5, and 2 cm. below the bottom of the diaphragm, and two cells in which double diaphragms (Fig. 4A) separated by $\frac{1}{32}$" with initial water levels 1 cm. and 1.5 cm. below the bottom of the lower diaphragm were used. The assembled cells were set under a bell jar shown in Fig. 9, and air at 73°F., regulated to give a flow of 6 cu. ft/hr, was dried over calcium chloride and delivered to the jar.

The decrease in weight of the single-diaphragm cell with the water 1 cm. below the diaphragm was used as a separate measure of the water vapor

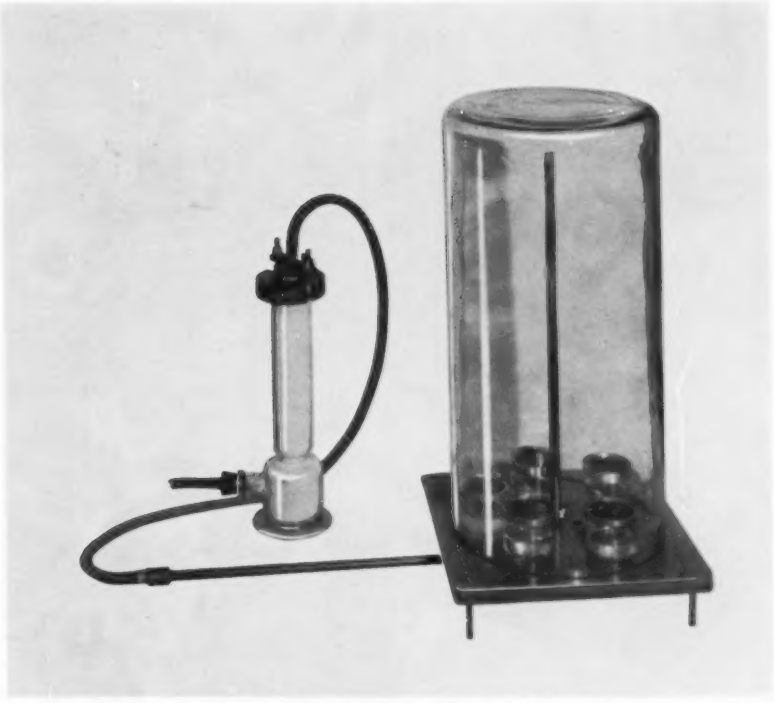


FIGURE 9.—Assembled apparatus for Method E.

permeability. These values are given in Table I under Method E_1 and are valid for comparison with other methods.

The results obtained with the 5 cells can be used in Goodings' method to determine the thickness of still air which has the same resistance to water transmission as a single diaphragm. These results are given in Table I under Method E_2. Because the method appears to be unsuited to so variable a material as leather (see Results, para. 5), the method for calculating the water permeability is not given here but may be found in Goodings' paper (8).

Method F.—This is essentially the official method of the A.L.C.A. The test was set up as shown in Fig. 4B except that calcium chloride instead of water was used to fill the dish. The dish was inverted and set on a pair of rods inside a bell jar. Air conditioned to 100% relative humidity and 73°F. in the condenser system illustrated in Fig. 8 was introduced into the jar at the rate of 6 cu. ft/hr. The results obtained by this method are given in Table I.

RESULTS

1. The results plotted in Figs. 3 and 6 and those given in Table I show that as the grease content of the leather is increased, the water vapor permeability of the leather is decreased.

2. The values given in Table I show that the leathers are rated in the same order by all the methods except Method E_2. The ratios of the permeabilities of specimens 2, 3, and 4 to the permeability of specimen 1 are nearly the same for all methods except E_2 and F. The results indicate that as long as one side of the diaphragm is subjected to essentially dry air and the other side is in contact with air at nearly 100% relative humidity, the mechanics by which these conditions are obtained have very little influence on the qualitative results.

3. The variations between the quantitative results obtained on any specimen by different methods are quite high. As would be expected, any means which is used to increase the speed of the air over either the wet or the dry side of the diaphragm increases the quantitative rate of water transmission. Figs. 3 and 6 show that increasing the velocity of the air over the dry side of the diaphragm in Methods A and B results in an increase in the measured value of the water vapor permeability and points to the necessity of controlling the motion of the air over the test cells. However, the change in the water vapor permeability due to changes in the air velocity is not very great, and any system which gives reasonably uniform air motion over all test cells will be sufficient to produce good results.

No information was obtained directly on the effect of air velocity on the wet side of the diaphragms in Methods D and F. It is probably safe to assume that the effect would be similar to that mentioned above, and that reasonable care to assure uniform air motion over all test cells is necessary for good results.

4. Method F, which uses the same principle as the A.L.C.A. method except that the time of test was substantially increased, is the only single diaphragm method which is not in close qualitative agreement with the rest. While it rates the leathers in the same order as the other methods, it reduces the spread between the leathers. No attempt was made to determine the cause of the differences in results obtained by this method except to note that (*a*) in specimen # 1 the dry side of the diaphragm became coated with a film of damp salt which was absorbed into the surface and would not shake off when the cell was opened and (*b*) some oil was transferred from the specimen into the desiccant, the amount increasing with the grease content of the specimen. It is probable that both these effects were exaggerated in comparison with the A.L.C.A. method due to the long testing time used in these experiments.

5. Method E_2 is the only method which gave results in flat disagreement with the other methods. This method has much to recommend it as a research method on uniform materials such as textiles where several diaphragms with a high order of uniformity can be secured. With leather there may be as much as 30% variation in the water vapor permeability of two diaphragms which are cut adjacent to each other, and a method which depends on the uniformity of a number of individual specimens cannot be used. The calculated value of the resistance of leather to water transmission can be changed over a wide range by rearranging the same specimens in different orders in this test.

A much more significant value of the water vapor permeability could be obtained by running tests on 5 to 7 separate diaphragms by one of the other methods and averaging the results than can be obtained by a single test in which this method is used.

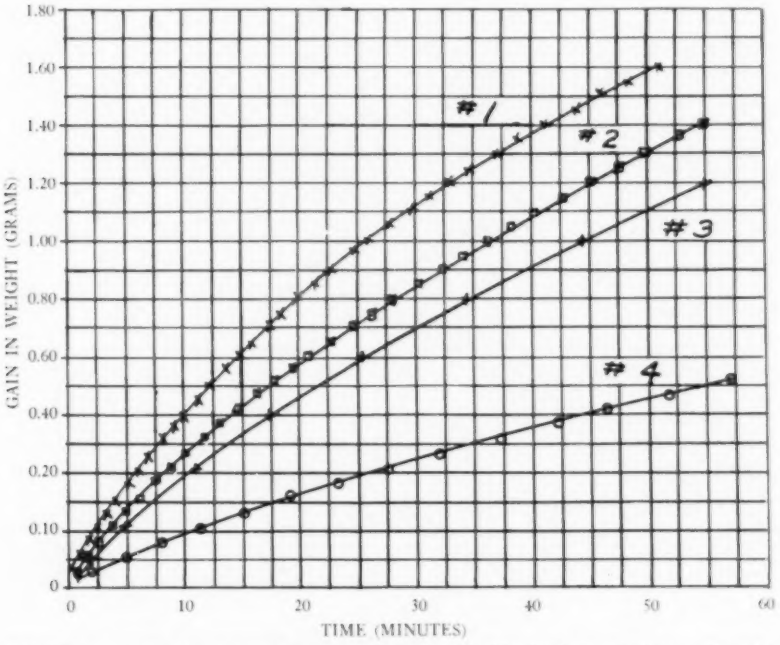


FIGURE 10.—Regain curves for vegetable-retanned side leather: specimens brought to equilibrium with air over $CaCl_2$ at 73° F. and then exposed to air at 73° F. and 100% relative humidity.

Water vapor permeability and regain.—The positive and negative regain curves had been determined for each of the original 40 specimens be-

fore any water vapor permeability tests were run. A comparison of the regain and permeability results indicated that the grease content of the leather influenced both properties in much the same manner. Where water vapor permeability of a material is a rate function, it was felt that it might be closely related to a combination of the rates of positive and negative regain in atmospheres like those used on the two sides of the diaphragm in the water vapor permeability test. This concept was tested as follows:

Leather diaphragms were stored in a desiccator over calcium chloride at 73°F. until they were near equilibrium with the atmosphere. The regain curve was then determined in air at 73°F. and 100% relative humidity and a flow rate of 6 cu. ft./hr. The curves for the four specimens used in the water vapor tests are plotted in Fig. 10.

The specimens were then stored in a desiccator over water at 73°F. until they were near equilibrium with the atmosphere. The drying curves were then determined in air at 73°F. dried over calcium chloride. The curves for the same four specimens are plotted in Fig. 11.

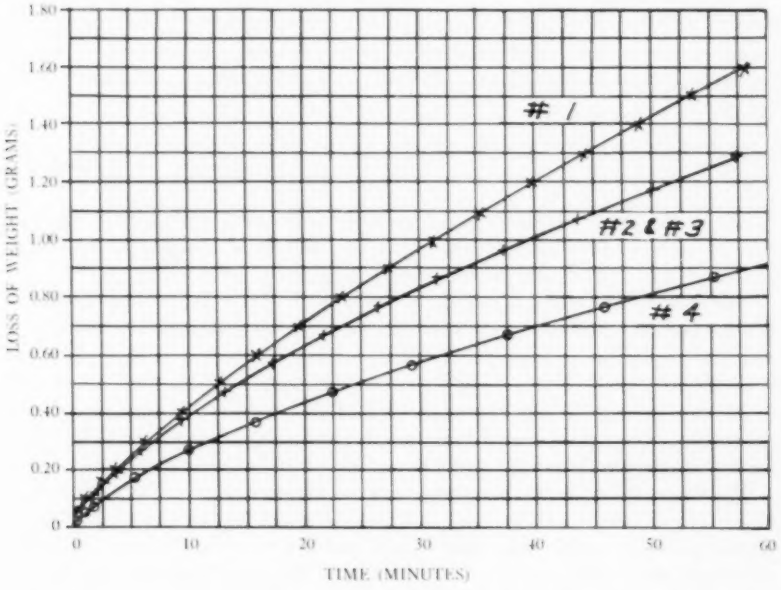


FIGURE 11.—Drying curves for vegetable-retanned side leather: specimens brought to equilibrium with air at 73° F. and 100% relative humidity and then exposed to air dried over $CaCl_2$ at 73° F.

The curves are all of the form

$$w = a\,(1 - e^{bt})$$

where a and b are constants, w = the change in weight of the specimen in grams, and t = time of exposure in minutes.

For these equations

$$\frac{dw}{dt} = -abe^{bt}.$$

The constants of the equations, the values of $\frac{dw}{dt}$ at one minute, and the products of the rate of regain and the rate of drying are as follows:

Regain	*Spec. 1*	*Spec. 2*	*Spec. 3*	*Spec. 4*
a	0.961	1.128	1.221	0.705
b	-0.0359	-0.0208	-0.0160	-0.0123
$\frac{dw_1}{dt}$ g/min.	0.0333	0.0230	0.0193	0.0085
Drying				
a	2.960	2.618	2.141	1.404
b	-0.0129	-0.0165	-0.0170	-0.0174
$\frac{dw_2}{dt}$ g/min	0.0377	0.0424	0.0358	0.0242
Product				
$\frac{dw_1}{dt} \times \frac{dw_2}{dt}$	0.00125	0.000975	0.000689	0.000205

The water vapor permeability of each specimen as determined by Method A is plotted against the products of the rate of regain and rate of drying at zero time and at 1, 5, and 10 minutes, in Fig. 12.

The plot for zero time is exactly straight over all 4 points. The plot for 1 minute shows 3 points on a straight line, but one is slightly off, indicating a possible beginning of curvature. The plot for 5 minutes shows still more tendency to curve. Even though the line is drawn straight, no 3 points are quite on a straight line. The departure of this curve from linearity is not significant except insofar as it indicates the beginning of curvature. The plot for 10 minutes is definitely curved.

These results indicate that there is some definite relation between water vapor permeability and the combined rates at which leather can absorb water from moist air into the drier inner body and deliver water from moist inner fibers to a drier surface where it can be lost to the air. These two actions are certainly occurring simultaneously in the test specimen; and the measured value of the water vapor permeability is at least partially dependent on the ability of the leather to absorb, transmit, and lose water.

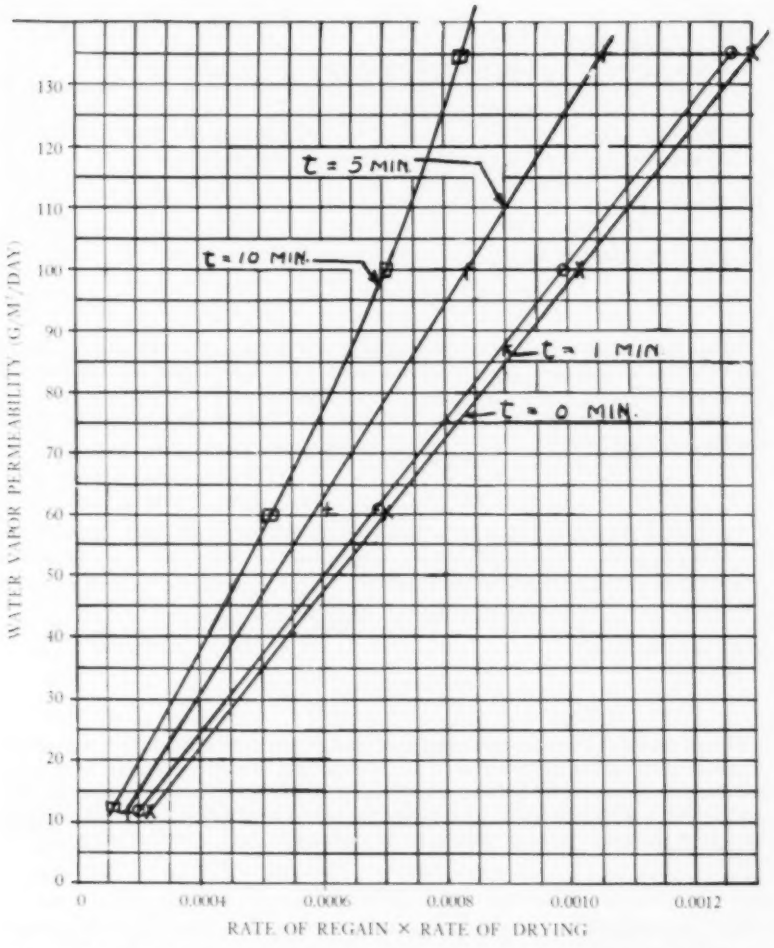


FIGURE 12.—Relation between water vapor permeability of vegetable-retanned side leather and the rate at which it takes on or gives up water from the air.

REFERENCES

1. A.S.T.M. Tentative Method D783-44T.
2. A.S.T.M. Tentative Method D697-42T. Methods A & B.
3. T.A.P.P.I.—"Standard Method for Moisture Permeability of Paper." *Paper Trade J.*, **111**, 25 (1940).
4. Federal Specifications KK-L-311-20. Method 270.1, "Permeability to Water Vapor."

5. "Method for Measuring the Permeability of Leather to Water Vapor." A.L.C.A. Method E25, 1946.
6. Fourt, L., and M. Harris. *Textile Research J.*, **17**, 256 (1947).
7. General Discussion of the Present Status of the Measurement of Water Vapor Permeability. *Paper Trade J.*, **116**, No. 14, 11 (1943).
8. Goodings, A. C. Committee on Aviation Medicine, Report No. 390, "Clothing Test Methods." National Research Council, February 1945, pp. 91–6.
9. Hobbs, R. E. *JALCA*, **36**, 346 (1941).
10. Kanagy, J. R., and R. A. Vickers. *JALCA*, **44**, 211 (1950).

Received November 30, 1957.

Forage for 4 Million Head of Livestock. Cattle and sheep graze on 61 million acres of National Forest range part of each year. It is mostly high country range, available only for three to five months, but just right to relieve the valley ranges on which ranchers run livestock in the spring and fall. About 20,000 ranchers now use the National Forests for grazing under paid permits.
—National Wildlife Federation, Washington, D. C.

The Bureau of Land Management is the agency in the U. S. Department of the Interior that has the primary responsibility for the management of the natural resources on the remaining unreserved and unappropriated public lands. As custodian of these lands, the Bureau has the responsibility for administering the great body of public land laws, including the Taylor Grazing Act, the mineral leasing acts, and the mining laws as they apply to public lands.
—*Ibid.*

Bureau [of Land Management] range managers and technicians work with programs to conserve water and other resources in the management of western rangelands so as to provide food and cover for wildlife and forage for livestock. To properly allow for this use by ranchers and farmers they issue grazing permits, in grazing districts established under the Taylor Grazing Act, and grazing leases for those public lands outside of these districts.
—*Ibid.*

Some 50,000 ranchers run livestock in national forests, grazing districts and other federal areas. Use of these lands is seasonal but highly important in the year-round livestock operation of ranchers who do not own enough grazing land for their herds.

A third of the beef cattle and most sheep in the West get part of their feed from these sources. But only one-fifth of the feed needed for this western livestock comes from federal land.

Grazing in national forests and grazing districts is allotted according to law and regulations but the rancher does not bid competitively for it. He pays a grazing fee, which is well below that which comparable private land rents for. Grazing as a federal land use is being decreased in order to prevent over-use and thus erosion.
—*Ibid.*

THE INFLUENCE OF TEMPERATURE UPON THE UPTAKE OF SALT BY CATTLEHIDE DURING BRINING

RAYMOND HAUCK AND ROBERT M. LOLLAR

Tanners' Council Research Laboratory
University of Cincinnati
Cincinnati 21, Ohio

ABSTRACT

The influence of elevated temperatures for short periods of time during brine curing of cattlehide was studied by means of a Latin-square split-plot experimental design. Pieces of cattlehide were brined for periods of 1½, 3, 4½, and 24 hours at 73°, 98°, and 120° F. The ratio of ash to moisture secured from the pieces brined for short periods and held for 30 days was in the range of 5.02% to 12.12%, while the ratio for pieces brined 24 hours and held for 30 days was in the range of 21.20% to 27.42%. Thus, it is evident that elevated temperatures for short periods of time do not give adequate brining to the hide.

—×—×—

INTRODUCTION

Extensive research has been conducted on the brine curing of cattlehide. Yet very little information is available regarding the effect of increased temperature as a means of reducing the time necessary to treat hides in saturated brine. The only work recently reported (1) investigated brine curing of cattlehides at temperatures of 20°, 40°, 50°, and 60° C. (68°, 104°, 122°, 140° F.). Soaking was done for periods of 2, 4, 8, and 12 hours in 24% salt brine. Both laboratory and plant-scale experiments were run for the purpose of investigating the increase in the rate of preservation and the improvement in the quality of the hides. The data indicate that the hides will take up about 10–12% salt after 8 hours treatment in 24% brine at 104° F. In a plant operation the addition of 0.075% Na_2SiF_6 was very useful in decreasing the microflora of the hides and brine.

A more comprehensive review of the literature regarding green-salt-and brine-curing practices may be found in our recent article (4) concerned with hide and leather quality interrelationships.

Our present experiment was devised to supplement the data reported by Bol'shakov *et al.* (1) and also to afford information regarding the comparison of short-brined stock to 24-hour-brined stock each treated at three temperatures. The effects of brining cattlehide for 1½, 3, 4½, and 24 hours at 73°, 98°, and 120° F. were studied by means of physical testing, microincineration, histology, and chemical analyses performed on the cured hide specimens. Statistical interpretations are presented on data for the ratios of ash to moisture secured at the brining times and temperatures employed.

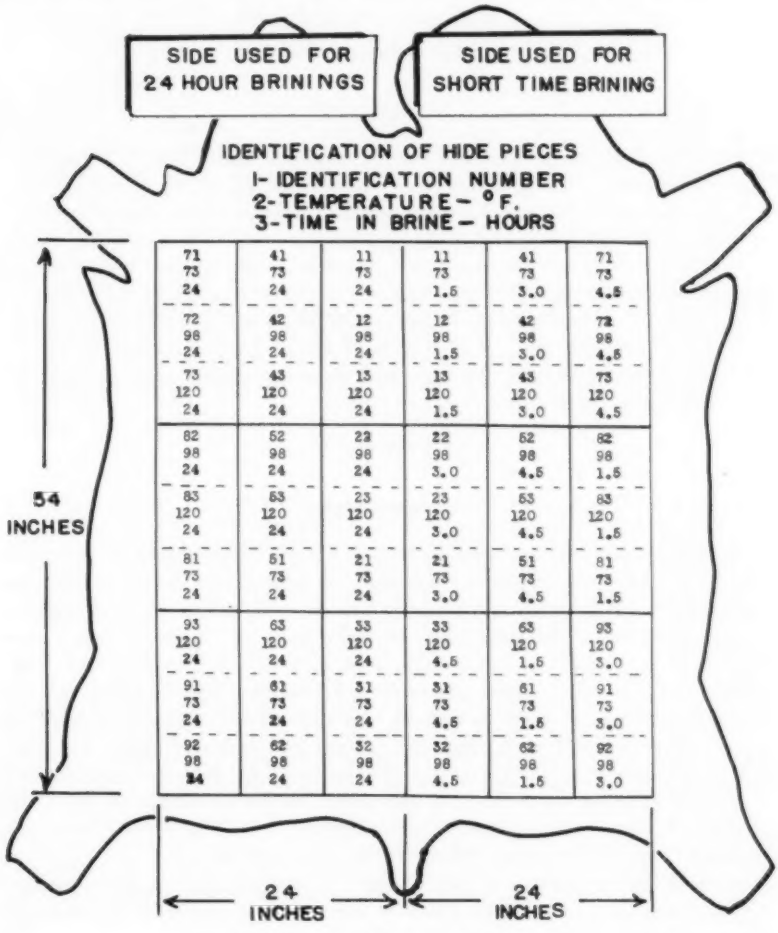


FIGURE 1.—Hide sampling plan.

EXPERIMENTAL METHOD

A fresh 66-pound kosher-killed native steerhide was trimmed and cut down the backbone. One half of the hide was used for 24-hour brining. The other half of the hide was immediately cut into 9 blocks of 18″ x 8″, and each of these blocks was then subdivided into 3 pieces of 6″ x 8″. Specimens were selected for the several treatments in accordance with the requirements of a Latin-square split-plot experimental design (2) as illustrated in Figure 1. All brining conditions employed were with saturated brine which had been preheated and maintained at the designated temperatures and saturation for the duration of brining.

Four hours after flaying, the half of the hide reserved for 24-hour brining was cut into 27 pieces after the manner used for the preceding half. Specimens 11, 61, 81, 21, 41, 91, 31, 51, and 71 were immersed in saturated brine preheated to 73° F. and maintained at this temperature for the duration of brining. Similarly, specimens 12, 62, 82, 22, 42, 92, 32, 52, and 72 were brined at 98° F. for 24 hours, and specimens 13, 63, 83, 23, 43, 93, 33, 53, and 73 were brined at 120° F. for 24 hours.

Immediately after treating the pieces in saturated brine for the prescribed periods of time, samples were taken from each piece for microincineration analysis. Samples of hide were also taken from each brined piece for chemical analyses. Moisture was determined by weight loss of 5 grams of hide after drying 16 hours over P_2O_5 at 176° F. in a vacuum oven. Total ash was secured from burning off 5 grams of hide in a crucible over an open flame followed by heating the sample to 1112° F. for 16 hours in a muffle furnace. Total nitrogen was obtained by using the Kjeldahl method on 1 gram of hide. Copper sulphate was used as the catalyst, sodium sulfate as the boiling point elevator, and 30 ml. of conc. H_2SO_4 as the digestion medium. Digestion time was for 2½ hours after the cloud point was reached.

The hide specimens were placed in plastic bags to reduce moisture loss, stored for 15 days at 70° F. and 54% R.H., and then at 40° F. for 15 or more days until they were subject to analysis. After the 30-day period the hide pieces were evaluated by microscopic examination of cross sections of the cured hide specimens, by determination of the hide volatile nitrogen, and by material-balance analyses which include moisture, ash, fat, and total protein. A histological rating was secured from the microscopic examination of cross sections stained for various hide components. Somer's volatile nitrogen procedure (9) was modified by using calcium hydroxide as the alkalizing agent in a direct distillation of the volatile nitrogen in the hide extracts. The moisture and ash were determined by the previously described methods. The fat content was obtained by chloroform liquid—liquid extraction of a hide hydrolyzate (6*N* H_2SO_4 for 16 hours). The total nitrogen was obtained by determining the nitrogen in a 50-ml. aliquot of the chloroform-free hydrolyzate by the Kjeldahl method; total protein equals 5.62

times the total nitrogen. The ball-puncture-strength was measured in pounds using a $^{1}/_{8}$-inch hemispherical-tipped puncturing tool.

The data obtained for moisture and ash from the treated hide pieces were calculated as the ratio of ash to moisture. Statistical differences due to time and temperatures of brining as reflected in the ratios of ash to moisture were computed separately for short-period brines and 24-hour brines. This statistical design, which has been used to minimize differences due to hide area, is analyzed as a split-plot design (2). The statistical t-test was used to evaluate any differences between ball-puncture strength of the pieces brined for short periods versus the pieces brined for 24 hours.

EXPERIMENTAL RESULTS

Table I presents data secured immediately after brining treatments on the salt penetration into the hide specimens. The microincinerated samples illustrate the lack of salt penetration into the grain layer of specimens brined for a short period of time at any of the three temperature conditions. It is also evident from the data that the initial salt penetration is only from the flesh side. That portion of the data concerned with hide specimens brined for 24 hours at temperatures of 73°, 98°, and 120° F. shows the penetration and distribution of the salt to be fairly uniform throughout the hide area.

Analyses of moisture, ash, and total Kjeldahl nitrogen were secured on all specimens shortly after brining. The results of the determinations of moisture and ash are expressed on a basis of the ratio of ash to moisture, and the data are shown in Table II. Except for some effects due to hide position the table of analysis of variance indicates that both time and temperature govern the ratios of ash to moisture for hide pieces brined for short periods. These same results indicate that temperature influences the ratio more than increased time for the series brined for short periods. The same technique of analysis of variance when applied to the series brined 24 hours treats time as a constant, as it should be under the experimental conditions. In this instance the temperatures are shown to contribute a significant difference in the ratios of ash to moisture secured by brining hide specimens for 24 hours.

An analysis of variance of puncture data failed to disclose any differences in strength within the short-period brines due to either temperature or time. A similar test failed to show any differences in strength between specimens treated for 24 hours in brine for the three temperature conditions. Therefore we felt justified to test the differences that might result from brining for short periods of time and for 24 hours. Table III presents the data for ball puncture of all specimens treated. The statistical t-test (8) established the superiority of this physical characteristic for specimens brined for 24 hours and held in cure for 30 days over those specimens treated for a short time and held in cure for 30 days.

TABLE I

SALT PENETRATION IMMEDIATELY AFTER BRINING AS DEMONSTRATED BY MICROINCINERATION

Identification Number	Short Brines			24-Hour Brines		
	Grain 1/3	Center 1/3	Lower 1/3	Grain 1/3	Center 1/3	Lower 1/3
Temperature of Brining—**73**° *F.*						
11	0	3	3	6	6	6
61	0	1	1	6	6	6
81	0	2	2	6	6	6
21	0	4	4	7	7	7
41	0	4	6	6	6	6
91	2	6	6	6	6	6
31	4	6	6	7	7	7
51	2	4	6	6	6	6
71	2	6	6	6	6	6
Temperature of Brining—**98**° *F.*						
12	0	3	3	6	6	6
62	0	3	3	6	6	6
82	0	2	2	6	6	6
22	2	4	4	5	5	5
42	1	6	6	5	5	5
92	2	6	6	6	6	6
32	4	6	6	5	5	5
52	2	6	6	5	5	5
72	2	4	6	5	5	5
Temperature of Brining—**120**° *F.*						
13	0	2	2	6	6	6
63	0	1	1	6	6	6
83	0	2	2	6	6	6
23	0	4	4	6	6	6
43	0	2	2	6	6	6
93	0	2	2	7	7	7
33	2	6	6	6	6	6
53	4	6	6	6	6	6
73	4	4	6	7	7	7

SALT PENETRATION

None	0
Very slight	1
Slight	2
Slightly better	3
Some	4
Fair amount but less than 6	5
Fair amount	6
Much	7

TABLE II

ASH IN HIDE AFTER BRINING AND BEFORE 30-DAY STORAGE

(Ash given as percent by weight of percent moisture)

Temperature of Short Brines (°F.)				Temperature of 24-Hour Brines (°F.)			
Hours	73°	98°	120°	Hours	73°	98°	120°
1½	4.72	4.93	6.67	24	18.16	19.15	25.65
1½	6.26	8.18	9.03	24	21.95	25.25	26.51
1½	6.24	7.93	10.41	24	23.27	25.67	27.36
3	6.68	9.50	9.43	24	19.38	22.05	25.46
3	8.12	10.31	9.84	24	22.60	25.40	26.04
3	10.25	13.25	9.66	24	23.97	25.87	27.27
4½	8.48	9.57	9.96	24	20.93	24.36	27.37
4½	9.28	10.75	11.84	24	21.66	24.83	26.29
4½	9.33	11.82	14.17	24	24.09	26.27	27.42

ANALYSIS OF VARIANCE

Source of Variance	D.F.	Mean Square	F-Value
Row	2	0.00150130	36.72*
Column	2	0.00006232	1.52
Time	2	0.00283519	69.35*
Error (1)	2	0.00004088	
Temperature	2	0.00143780	18.41†
Time × temperature	4	0.00021062	2.70
Error (2)	12	0.00007812	

ANALYSIS OF VARIANCE

Source of Variance	D.F.	Mean Square	F-Value
Row	2	0.00233499	8.14
Column	2	0.00024723	——
Time	2	0.00029185	1.02
Error (1)	2	0.00028694	——
Temperature	2	0.00522746	43.12†
Time × temperature	4	0.00005006	——
Error (2)	12	0.00012122	

*Significant at 5% level.
†Significant at 1% level or better.

Table IV presents the data secured on the calculated ratios of ash to moisture of hide specimens brined both for short periods and for 24 hours after 30 days in cure. The effect of time and temperature on the ratios of ash to moisture are more apparent for the specimens brined for short periods after the 30 days in cure (compare with Table II). There is no longer any evidence of effects of hide position, and the effect due to time of brining is more significant. Time remains a constant for those pieces brined for 24 hours at the 3 different temperature levels; and the effect on the ratios of ash to moisture due to the temperatures of brining is more pronounced after storage than immediately after brining.

TABLE III

BALL PUNCTURE (IN LBS.) OF SPECIMENS AFTER 30-DAY CURE PERIOD

Identification Number	Short-Period Cure	24-Hour Cure
*Temperature of Brining—***73°** *F.*		
11	114	99
61	75	145
81	96	145
21	109	158
41	112	110
91	75	96
31	124	151
51	135	149
71	70	116
*Temperature of Brining—***98°** *F.*		
12	102	136
62	97	143
82	116	109
22	107	148
42	122	129
92	31	110
32	124	136
52	126	151
72	91	54
*Temperature of Brining—***120°** *F.*		
13	117	131
63	158	150
83	115	130
23	129	131
43	130	126
93	104	104
33	78	140
53	146	154
73	89	126
Average	**107.1**	**128.8**

The results obtained for assessing a histological rating to the specimens from each cure condition are listed in Table V. This rating has been devised to measure those effects noted in the changes occurring to hide components which reflect cure conditions. A rating of 9 or less has been arbitrarily chosen

TABLE IV

ASH IN HIDE AFTER 30-DAY STORAGE

(Ash given as percent by weight of percent moisture)

Temperature of Short Brines (°F.)				Temperature of 24-Hour Brines (°F.)			
Hours	73°	98°	120°	Hours	73°	98°	120°
1½	6.73	5.02	7.73	24	22.53	25.80	27.42
1½	6.36	7.19	7.73	24	21.20	23.75	26.21
1½	6.65	7.27	8.08	24	21.78	24.13	26.68
3	9.53	9.82	10.06	24	21.93	24.64	27.12
3	9.45	9.71	9.95	24	22.43	24.66	26.36
3	10.39	10.49	10.34	24	21.71	24.75	26.86
4½	11.03	10.99	11.53	24	22.04	24.68	27.38
4½	10.23	10.49	10.78	24	21.59	24.03	26.95
4½	10.60	10.90	12.12	24	22.26	25.40	26.67

ANALYSIS OF VARIANCE

Source of Variance	D.F.	Mean Square	F-Value
Row	2	0.00008178	4.16
Column	2	0.00004647	2.36
Time	2	0.00388369	197.34*
Error (1)	2	0.00001968	
Temperature	2	0.00017838	7.64*
Time × temperature	4	0.00003182	1.36
Error (2)	12	0.00002336	

ANALYSIS OF VARIANCE

Source of Variance	D.F.	Mean Square	F-Value
Row	2	0.00011241	6.59
Column	2	0.00008607	5.04
Time	2	0.00000641	——
Error (1)	2	0.00001707	
Temperature	2	0.00544112	382.64*
Time × temperature	4	0.00000159	——
Error (2)	12	0.00001422	

*Significant at 1% level or better.

as a rating for stale hides. A rating of 17 reflects a hide in excellent condition with respect to cure. More than 50% of the specimens brined for short periods of time received a rating sufficiently low to rate them as stale hide pieces. Three samples of each temperature condition for the specimens brined for 24 hours were rated. Every sample received a rating higher that that reserved for stale hides. These data, therefore, indicate that short times for brining regardless of the temperature used will not cure the hide sufficiently to give adequate preservation.

A material balance consisting of moisture, ash, fat, and total nitrogen expressed as hide substance (%T. N. × 5.62) was secured for all test specimens after a 30-day cure. A composite material balance for each curing

TABLE V

HISTOLOGICAL RATING

Identification Number	Fat	Corium Fibroblasts	Epidermal Cells	Epidermis Slippage	Collagen Spread	Epidermal Voids	Total Rating
			SHORT-PERIOD BRINES				
Temperature of Brining—**73**° *F.*							
41	2	1	1	1	3	2	10
51	2	1	1	1	2	2	9
61	1	1	1	1	1	2	7
Temperature of Brining—**98**° *F.*							
42	2	2	2	1	3	2	12
52	1	1	1	1	2	2	8
62	1	1	1	1	3	2	9
Temperature of Brining—**120**° *F.*							
43	2	1	2	1	3	3	12
53	2	1	1	1	1	1	7
63	2	1	2	3	2	2	12
			24-HOUR BRINES				
Temperature of Brining—**73**° *F.*							
41	2	3	3	3	2	2	15
51	2	2	3	3	3	2	15
61	2	1	1	1	2	3	10
Temperature of Brining—**98**° *F.*							
42	2	3	3	3	3	3	17
52	2	1	2	1	3	3	12
62	2	2	3	3	2	2	14
Temperature of Brining—**120**° *F.*							
43	2	2	2	3	3	1	13
53	1	2	3	3	1	2	12
63	2	2	2	3	2	2	13

Ratings are based on the following units, 3 denoting top quality and 1 denoting poor quality:

Fat	Corium Fibroblasts	Epidermal Cells	Epidermis Slippage	Collagen Spread	Epidermal Voids
1 or 2	1,2,3	1,2,3	1 or 3	1,2,3	1,2,3

TABLE VI

MATERIAL BALANCE AND VOLATILE NITROGEN AFTER 30-DAY STORAGE

Period of Brine (hr.)		Temperature (°F.) 73°	98°	120°
1½	Moisture—%	53.88	55.86	55.02
	Ash—%	3.54	3.64	4.32
	Grease—%	10.52	4.65	6.49
	Protein—%	30.85	34.13	32.52
	Balance—%	98.79	98.28	98.35
	% V.N. of total nitrogen	2.36	1.94	1.60
3	Moisture—%	53.61	54.40	51.53
	Ash—%	5.25	5.45	5.22
	Grease—%	7.42	6.24	9.02
	Protein—%	31.94	32.86	32.65
	Balance—%	98.22	98.95	98.42
	% V.N. of total nitrogen	0.50	1.01	0.78
4½	Moisture—%	52.88	53.29	51.92
	Ash—%	5.61	5.75	5.96
	Grease—%	6.90	4.51	4.79
	Protein—%	33.25	34.83	34.45
	Balance—%	98.64	98.38	97.12
	% V.N. of total nitrogen	0.67	0.64	0.76
24	Moisture—%	47.22	44.66	43.74
	Ash—%	10.36	10.99	11.74
	Grease—%	9.09	10.16	9.53
	Protein—%	33.43	33.55	35.16
	Balance—%	100.10	99.36	100.17
	% V.N. of total nitrogen	0.14	0.31	0.29

treatment was calculated from these data, and the results are listed in Table VI. Volatile nitrogen figures are posted for each composite in the appropriate columns. These volatile nitrogen figures are expressed as the percent volatile nitrogen of the total nitrogen for the respective treatments. The moisture ranged from 55.86 to 51.53% for specimens treated to a short-

period brine. The ash content was in the low range of 3.54 to 5.96% for these same specimens. Volatile nitrogen of all short-period brines have exceeded the limits defined by Lollar and O'Flaherty (7) for hides receiving an adequate cure. The moisture content of the 24-hour-brined specimens ranged from 43.74 to 47.22%, and correspondingly the ash content rose to over 10%. The volatile nitrogen of these 24-hour-brined pieces was not excessive under the prevailing storage conditions of closed plastic bags.

DISCUSSION

While a ratio of ash to moisture of 35.9%, i.e., complete salt saturation of the water retained by the hide, has been suggested (5) as a prime factor in determining the efficiency of curing, DeBeukelaer (3) has emphasized that hides conventionally cured either by green-salting or brining seldom attain a condition of complete saturation except for cases involving subsequent evaporation of sufficient moisture during storage. Experimental results would substantiate that salt saturation is not reached after 24-hour brining or 48-hour green-salting without subsequent evaporation of moisture during storage.

Strandine, DeBeukelaer, and Werner (10) present data on the stratigraphic distribution of sodium chloride and moisture in steerhide brined for 24 hours in saturated brine. Their ratio of ash to moisture on the average results is 26.7% after brining. Kritzinger and van Zyl (6) present similar data for hide cured for 24 hours with crystalline salt. Their ratio of ash to moisture on the average results is 26.4% after salting. Our ratio of ash to moisture for pieces brined 24 hours at 73° F. averages 21.8%; for pieces treated at 98° F., 24.3%; and for pieces treated at 120° F., 26.6%. These lower results are primarily due to the method of obtaining the samples. Our samples were obtained by dicing the specimens with a knife while the results of Strandine *et al.* (10) and Kritzinger and van Zyl (6) were determined by freezing the specimens for sectioning on a freezing microtome assembly. Thus in the course of preparation some freeze-drying results with accompanying evaporation of hide moisture.

After curing hide with crystalline salt for 48 hours the average ratio of ash to moisture for the stratigraphic distribution of sodium chloride secured by Kritzinger and van Zyl (6) was 31.8%. Steerhide brined for 4 days and analyzed for the stratigraphic distribution of sodium chloride by Strandine, DeBeukelaer, and Werner (10) produced an average ratio of ash to moisture of 30.3%. This ratio normally increases a few percent during the 30-day cure due to evaporation of moisture from the hide. Kritzinger (5) noted that hides become progressively drier the longer the cure period. Our data on the hide specimens brined for 24 hours and then held for 30 days indicate practically no evaporation took place because of the method of packaging the specimens in plastic bags for the duration of storage. The final average

ratios of ash to moisture are 21.9, 24.6, and 26.8% for treatments of 73°, 98°, and 120° F. respectively.

Salt curing is practiced to reduce the potential spoilage of hides due to autolysis and bacterial attack. Good cure practice represented by salting within a few hours after flaying, using new or clean salt of the proper size and amount, and with storage temperatures not in excess of 75° F., will normally control degradation due to autolysis. However, when no antiseptics are added to the salt, putrefaction of the hide due to bacterial attack is controlled by dehydration and salt concentration. Stuart and Frey (11) studied the influence of the moisture content upon the development of bacteria, ammonia nitrogen, and free carboxyl groups in salted calfskin kept 30 days at 86° F. When their data are calculated as a ratio of ash to moisture, the results indicate that increases in ammonia nitrogen, free carboxyl groups, and bacterial count are minor for skins having a ratio of ash to moisture of 25.7% or more. A significant increase in these criteria occurred when the ratio of ash to moisture fell below 23.5%.

Since a ratio of ash to moisture greater than 23% is vital in controlling degradation of hide due to bacterial attack, hides which are brined for short periods of time even at elevated temperatures cannot be expected to remain in good condition for 30 days. The highest ratio of ash to moisture found under the short-brine treatments was 14.2% immediately after brining. This ratio obtained on the specimens brined for 4½ hours at 120° F. fell to 12.1% after 30 days. Degradation of hide specimens treated to the short-period brine series was evidenced by the histological rating and the ammonia nitrogen analyses. The significant difference in ball-puncture strength, wherein the specimens brined for 24 hours were stronger than the specimens treated to the short-period brines, may be further evidence of breakdown of hide during cure.

ACKNOWLEDGMENTS

The authors would like to acknowledge the assistance of Mrs. Jean Tancous in the histological work reported in this paper. Further, the support of the Tanners' Council of America and the Tanners' Hide Bureau is gratefully acknowledged.

REFERENCES

1. Bol'shakov, A., A. Zinov'ev, M. Agul'nik, and G. Tinyakov. *Myasnaya Ind. S.S.S.R.*, **27**, No. 6, 18 (1956).
2. Cochran, W. G., and G. M. Cox. *Experimental Designs*, 2nd. ed. (New York: John Wiley and Sons, 1957) p. 298.
3. DeBeukelaer, F. I., in *Chemistry and Technology of Leather*, ed. F. O'Flaherty, W. T. Roddy, and R. M. Lollar. A.C.S. Monograph No. 134, Vol. 1 (New York: Reinhold Pub. Corp., 1956) p. 213.

4. Hauck, R., and R. M. Lollar. *JALCA*, **52**, 361 (1957).
5. Kritzinger, C. C. *JALCA*, **49**, 99 (1954).
6. ———, and J. H. M. van Zyl, *JALCA*, **49**, 91 (1954).
7. Lollar, R. M., and F. O'Flaherty. *Leather Mfr.* **72**, No. 2, 8 (1955).
8. Snedecor, G. W. *Statistical Methods*, 5th ed. (Ames, Iowa: Iowa State College Press, 1956).
9. Somer, G. L., *JALCA*, **37**, 34 (1942).
10. Strandine, E. J., F. L. DeBeukelaer, and G. A. Werner. *JALCA*, **46**, 19 (1951).
11. Stuart, L. S., and R. W. Frey. *JALCA*, **33**, 198 (1938).

Received September 15, 1957.

While wet skins putrefy and decay, dry ones are hard and horny; and nothing could be more natural to the hunter than to try to remedy this by rubbing the drying skin with the fat of the animal, of which he must have noticed the softening effect on his own skin. By this means a soft and durable leather may be produced, and this process of rubbing and kneading with greasy and albuminous matters, such as fat, brains, milk, butter and egg-yolks, is in use to this day, alike by the Tartars on Asiatic steppes and the Indians on American prairies; and not only so, but we ourselves still use the same principle in the dressing of our finest furs, and in the manufacture of chamois, and many sorts of lace- and belt-leathers.

—*The Principles of Leather Manufacture*. H. R. Procter. London: E. & F. N. Spon, Ltd., 1903.

Glue for Fine Leather Goods. Compound 1 pint of rye whiskey with the same quantity of water. Add to this 4½ ounces of powdered starch, and stir the mass into a paste. Then dissolve 1¼ ounces of good glue in the same quantity of water, add 1¼ ounces of thick turpentine, mix thoroughly, and finally combine this mixture, constantly stirring, with the above paste.

—*The Techno-Chemical Receipt Book*, ed. by William T. Brannt and William H. Wahl. Philadelphia: Henry Carey Baird & Co., 1892.

Artificial Leather (Stierlin's German and French Patent). A loosely-cohering fleece of flax, cotton, or hemp is prepared on the carding engine and immersed in a solution prepared as follows: Dissolve 25 parts of animal or vegetable glue, which has been exposed to the action of tannin, in 75 parts of water, and compound the solution with 20 parts of pipe-clay and 5 to 10 of any kind of tannin. The fleece is then passed through rollers heated by steam, which press out the excess of material, and is next brought into a bath containing a decoction of oak bark with 5 per cent. of glycerine. By this solution color, softness, and density are imparted to the fabric. After remaining here for 12 to 24 hours the fabric is taken from the bath and dried by means of hot or cold air, after which the leather is ready for use.

—*Ibid*.

EFFECT OF CHROME TANNING ON THE STRUCTURE AND WIDE-ANGLE X-RAY PATTERN OF COLLAGEN

M. S. Santhanam

University of Madras
Guindy, Madras, India

ABSTRACT

This paper deals with the changes produced in the X-ray diffraction pattern of collagen by chrome tannage. The various types of fixation of chromium complexes are discussed in relation to these observations which indicate that the type of fixation varies with the electrochemical nature of the chromium complex.

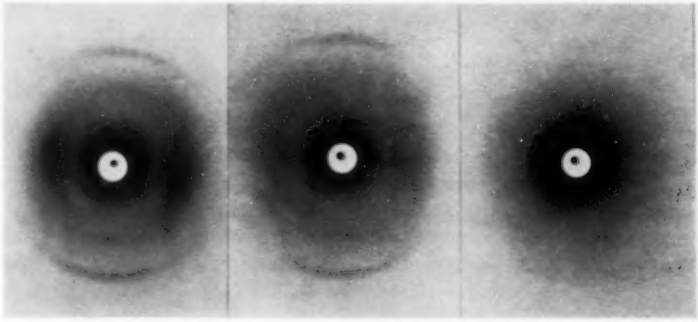
—x—x—

INTRODUCTION

The chemistry of chrome tanning has been the subject of many researches which have been reviewed by Gustavson (1,2). An X-ray study of chrome tanning has been made by Bear (3) who found that the wide-angle pattern is relatively insensitive to the entry of tanning agents except for a reduction in the degree of arcing of some of the sharper reflections. The small-angle pattern showed pronounced intensification of the third, sixth, and ninth orders, which Bear considers to be due to the entry of tanning agents predominantly into bands containing the highly hydratable acidic and basic side chains. A detailed theory of chrome tannage has been developed by Gustavson (4,5). He distinguishes between two main types of tannage depending on the electrochemical charge of the complex. In the case of cationic complexes the ionized carboxyl groups of collagen govern the fixation. The main part of the complexes is able to react with one carboxyl ion, and the initial ionic reaction is followed by penetration of the carboxyl group into the chromium complex, forming a strong coordinate link. Direct multipoint attachment of a polynuclear complex to the carboxyl groups of adjacent polypeptide chains is also possible, but only a small portion of the complexes, probably not more than one-tenth of the chromium fixed, will be able to combine with two carboxyl ions, which necessarily must occur in close proximity to be incorporated into the same complex. There may be two types of such bifunctional fixations:

(*a*) Intramolecular which does not contribute to the stability of the lattice.
(*b*) Intermolecular which results in linking adjacent chains and leads to increased stability of the lattice.

In the case of nonionic complexes and anionic complexes Gustavson considers that the fixation is mainly by nonionic protein groups. The hydroxyl group has been indicated to be the main site for the binding of nonionic complexes (4). Shuttleworth (6) has opposed this differentiation and suggested that the chief mechanism of chrome fixation is by coordination of chromium to the carboxyl groups of protein side chains and that this reaction is not determined by the charge on the complex but by the number and stability of groups occupying the available coordination positions of the chromium atoms. It has also been suggested that hydroxyl groups of hydroxyproline and serine are incapable of coordination with chromium under these conditions (7).



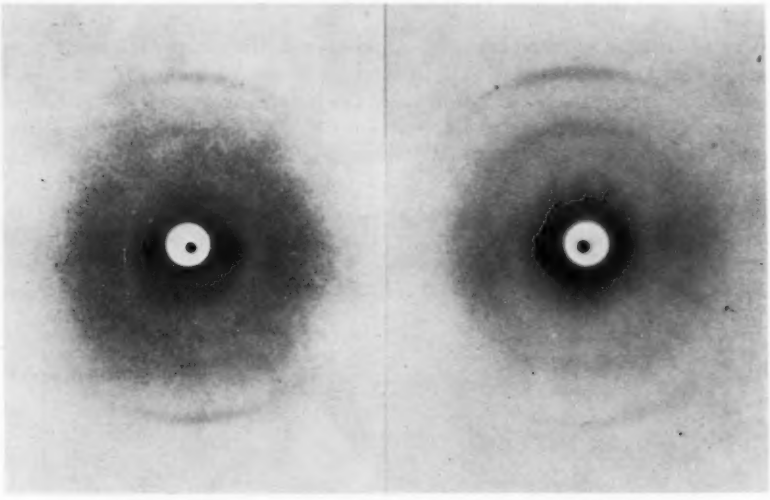
(*a*) (*b*) (*c*)

FIGURE 1.—X-ray diffraction patterns of kangaroo tail tendon fibers tanned at (*a*) pH 1.8, (*b*) pH 3.0, (*c*) pH 3.8, taken with copper Kα radiation on a flat film ($d = 3$ cm.).

EXPERIMENTAL METHODS

Kangaroo tail tendon fibers were used for the investigation. The chrome liquor was prepared from sodium dichromate by mixing it with an excess of sugar (150% of the theoretical amount) and adding sulfuric acid. The liquor was aged for two weeks before use. The theoretical basicity of the liquor would be 33%, while the actual basicity determined by the Procter-McCandish method was found to be 16%. The chrome content of the liquor was 80 g. Cr_2O_3 per liter. The pH of the liquor was 1.8. Liquors with higher basicities were prepared by addition of sodium hydroxide solution. The fibers were

kept in the tanning liquor for 48 hours, taken out, washed with distilled water, and acetone-dried. The X-ray patterns were recorded on a flat film using small and large specimen-to-film distances.



(*a*) (*b*)

FIGURE 2.—X-ray diffraction patterns of (*a*) well-tanned and (*b*) untanned kangaroo tail tendon fibers ($d = 5$ cm.).

TABLE I

MERIDIONAL AND EQUATORIAL SPACINGS OF KANGAROO TAIL TENDON TANNED AT DIFFERENT pH VALUES

(*All measurements are at room humidity—R. H. about 80%*)

Kangaroo Tail Tendon	Meridional	Equatorial
Untanned		
Normal	2.86 A.	11.8 A.
Stretched	2.95 A.	11.8 A.
Tanned at		
pH 1.8	2.98 A.	11.8 A.
pH 3.0	2.86 A.	11.8 A.
pH 3.8	2.86 A.	diffuse
pH 1.8, then 3.8	2.93 A.	11.0 A.
pH 1.8, then 3.8 then stretched	2.95 A.	11.0 A.

TABLE II

COMPARATIVE VALUES FOR UNTANNED AND WELL-TANNED KANGAROO TAIL TENDON

Condition	Untanned		Well-tanned	
	Meridional	Equatorial	Meridional	Equatorial
Dry	——	10.6 A.	——	~10.3 A.
Room humidity	2.86 A.	11.8 A.	2.93 A.	11.0 A.
Wet	2.86 A.	13.8 A.	2.93 A.	12.7 A.
Stretched (room humidity)	2.95 A.	11.8 A.	2.95 A.	11.0 A.

EXPERIMENTAL RESULTS

The X-ray diffraction patterns of the specimens tanned at pH 1.8, 3.0, and 3.8 are shown in Fig. 1. The pattern of the specimen tanned first at pH 1.8 and later at pH 3.8 is given side by side with that of an untanned specimen in Fig. 2. The measurements are summarized in Table I. The data for the well-tanned fiber are compared with those of normal collagen fibers in Table II. The final pH of tanning did not vary from the original pH, since only one or two fibers were used for tanning in a relatively large volume of solution.

In the pattern of the specimen tanned at pH 1.8 there is a distinct change in the meridional arc spacing and the value increases to 2.98 A., corresponding to the value of stretched collagen. The rest of the pattern does not show any marked difference from ordinary collagen. The pattern of the specimen tanned at pH 3 shows slight signs of disorientation, the spots in the third-layer line (8 A.) being rendered diffuse. There are no changes observable in the spacings of the equatorial spots or the meridional arc. In the case of the specimen tanned at pH 3.8 there is a pronounced loss of orientation and the 10–14 A. equatorial spots disappear. The meridional arc also is appreciably reduced in intensity although there is no change in the value of the spacing. In the pattern of the specimen tanned first at pH 1.8 and later at 3.8 the value of the meridional arc spacing increases to 2.93 A., which is larger than the normal value. The equatorial spots are clearly visible and the spacing comes down to a value of 11.0 A., from 11.8 A., at room humidity. The third layer spots are very diffuse and not recognizable.

On wetting the specimen the value increases to 12.7 A., while in the case of untanned fibers the corresponding value obtained is 13.8 A. The appreciable diminution of the equatorial spacing appears to have been observed in this investigation for the first time.*

*In the opinion of the reviewer of this paper this diminution of the equatorial spacing probably reflects the well-known fact that tanned collagen absorbs less water (swells less) than untanned collagen under like conditions. The editor concurs in this opinion.—Editor.

CONCLUSIONS

The results recorded above suggest that the types of chrome fixation taking place at pH 1.8 and 3.8 are distinctly different. At pH 1.8 the collagen pattern does not suffer any change except that the spacing of the meridional arc increases to the value of stretched collagen. In the course of unpublished investigations on the deposition of inorganic crystallites on collagen a similar change has been observed in collagen fibers treated with a dilute solution of sodium carbonate. The pattern shows an increase in the value of the meridional spacing and also a general increase in intensity. The pattern is very similar to the pattern recorded for the fibers tanned at pH 1.8. The increase in the spacing of the meridional arc is probably due to the incipient crystallization and deposition of quasicrystallites inside the fibers. Probably the lattice expands to fit in with the periodicity of the crystallizing material. It is also possible that some cross links are formed, whereby similar side groups in neighbouring protofibrils are brought to the same level, thus producing a sort of straightening of the protofibrils, which may be slightly kinked in the normal state.

Both in the tanned and sodium carbonate–treated specimens there is an intensification observable in the X-ray patterns. This may be due to the attachment of the strongly scattering metal atoms to the collagen chains at the reacting centers. It may be of interest to recall that Frey-Wyssling (8,9) has observed a similar intensification in the X-ray diffraction patterns of cellulose by deposition of small amounts of heavy metals.

The possible types of fixation of chromium in collagen are indicated in Fig. 3. Fig. 3 (*a*) indicates the situation that would be expected to occur when the tanning is done at pH 1.8. At this pH and basicity the chrome liquor would contain mainly cationic chromium complexes (10). The side chains of residues containing carboxyl groups (aspartic and glutamic acids) are fairly long, while the side chains of hydroxylic residues like hydroxyproline, serine, and threonine are comparatively short. In Fig. 3 the two types of side chains are indicated by long and short lines emanating from the sides of two adjacent protofibrils and terminating with circled heads. At pH 1.8 the cationic complexes are likely to be attached to the carboxyl groups. The majority would be attached to only one such group, while some may be able to combine with two carboxyl groups, resulting in a cross link between adjacent protofibrils. Both types of attachment are shown in Fig. 3 (*a*) where *M* stands for the metallic complex. Such a cross link is however not likely to lead to a closer bonding of the two fibrils since the side chains are fairly long and likely to be folded.

At the higher pH the nonionic complexes are likely to predominate because of the following: The presence of masking organic acids in the liquor, formed by incomplete oxidation of sugar (11), is indicated by the lower value for basicity obtained by the titration method. Further, the ordinary chrome

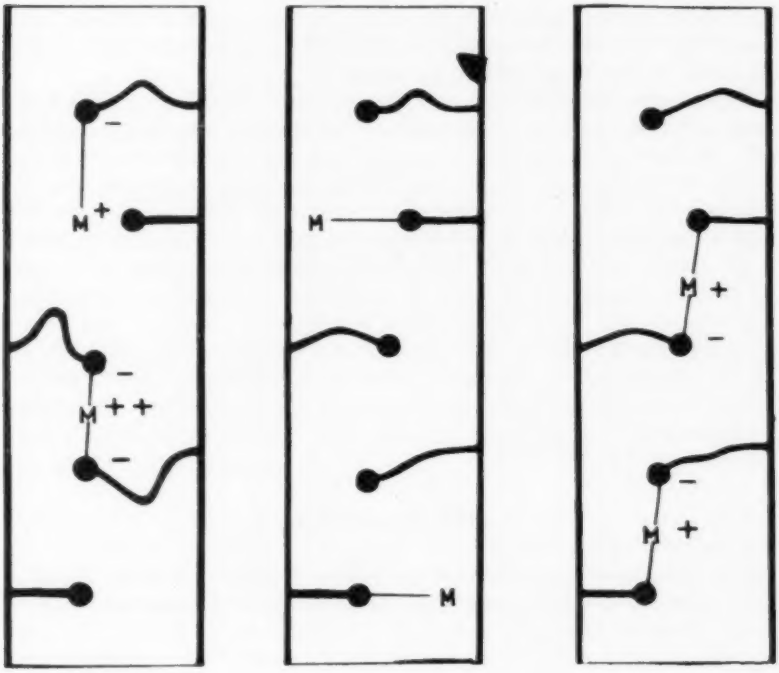


FIGURE 3.—Schematic representation of the mechanism of fixation of chromium complexes for different types of tanning: (*a*) pH 1.8, (*b*) pH 3.8, (*c*) first at pH 1.8 and then at 3.8.

liquor prepared from sodium dichromate contains 0.93 g. of sodium sulfate per gram of Cr_2O_3, and more sodium sulfate is formed by increasing the basicity of the liquor by addition of sodium hydroxide. These two factors (12,13) exert a deep-going effect on the electrochemical nature of the complexes and facilitate the formation of noncationic complexes at higher basicities.

These nonionic complexes are likely to be attached to the hydroxyl groups. The situation is shown in Fig. 3 (*b*) where the metal complex *M* is attached to the short side groups of hydroxy amino acid residues. Since the number of such residues is small, it is very unlikely that two of them will be in close proximity so that a cross link via the chromium complex is very improbable. The complex cannot also link with a carboxyl group, although one may be present nearby, since it is nonionic. Thus the metal complexes do not form

any bonds between protofibrils but simply remain attached to them. This would lead to a disordering of the collagen structure with the resultant loss of clarity in the X-ray pattern as observed.

On the other hand the pattern of the specimen tanned first at pH 1.8 and later at 3.8 shows no loss of orientation. The situation regarding the fixation of chromium complexes which one might expect in this case is shown in Fig. 3 (*c*). At the lower pH the cationic complexes get attached to the long side chains with carboxyl groups thus neutralizing their charge. After this process is completed, when the pH is increased to 3.8, these neutral complexes could then co-ordinate with the hydroxyl groups of the short side chains (Fig. 3 (*c*)). Since one of the side chains to which the complexes are attached is short, we may expect the protofibrils to be drawn nearer to each other. Such a bridging action of chromium would obviously enhance the stability of the collagen lattice and also block the entry of water to a considerable extent. The observation that both in the wet and dry conditions the spacing of the equatorial spot is definitely less in the tanned than in the untanned specimen is thus explained.

ACKNOWLEDGMENT

The author wishes to record his deep indebtedness to Prof. G. N. Ramachandran for the invaluable suggestions he gave and the keen interest he took in the course of this study.

REFERENCES

1. Gustavson, K. H. *Advances in Protein Chemistry*, vol. 5 (New York: Academic Press 1947).
2. ———. *Chemistry of Tanning Processes* (New York: Academic Press, 1956).
3. Bouldan, R. E. A., T. P. Salo, and R. S. Bear. *JALCA*, **46**, 124 (1951).
4. Gustavson, K. H. *J. Soc. Leather Trades' Chemists*, **36**, 182 (1952).
5. ———. *Ibid.*, **39**, 2 (1955).
6. Shuttleworth, S. G. *JALCA*, **47**, 387 (1952).
7. Cunningham, C. E., and S. G. Shuttleworth. *JALCA*, **47**, 661 (1952).
8. Frey-Wyssling, A. *Protoplasma*, **25**, 261 (1936).
9. ———. *Kolloid Z.*, **85**, 148, (1938).
10. Gustavson, K. H. *Chemistry of Tanning Processes* (New York: Academic Press, 1956) p. 16.
11. ———. *Ibid.*, p. 80.
12. ———. *Ibid.*, pp. 32, 48, 68.
13. ———. *Ibid.*, p. 77.

Received March 7, 1957.

LIFE LINES

Brief Biographies of Our Contributors

RAYMOND HAUCK—See the July, 1957, *Journal.*

DR. ROBERT M. LOLLAR—See the January, 1958, *Journal.*

MIETH MAESER, a graduate of Brigham Young University and Massachusetts Institute of Technology, has been associated with United Shoe Machinery Corporation for more than 20 years. He joined the A.L.C.A. in 1941 and immediately assumed an active role in devising, evaluating, and revising physical test methods for leather. He served the Association as chairman of the Physical Testing Committee for many years—relinquishing that post only recently when he became President-Elect and coordinator of all our technical committees. He will assume the presidency of the Association at our next annual meeting.

M. S. SANTHANAM is a pupil of Prof. G. N. Ramachandran, whose studies on the molecular structure of collagen, resulting in the triple helix hypothesis, have attracted world-wide attention. Mr. Santhanam graduated with honors in chemistry from the Presidency College, Madras, and was awarded a Research Fellowship by the University of Madras. His work under Professor Ramachandran on the structure and physicochemical aspects of the collagen group of proteins has resulted in the publication of four papers. A thesis based on this work has been submitted to the University of Madras for the award of the degree of Doctor of Philosophy. He is currently employed as a Lecturer in Chemistry in the Government Arts College, affiliated with the University of Madras.

Micoud's Artificial Leather. Knead boiled rye flour, pulverized Spanish chalk, some kind of coloring matter, and linseed oil into a uniform dough, and apply this to woollen or cotton tissues with a suitable instrument. Pumice the coat, when dry, and then brush it over with an oil varnish to which the desired color has been added. After an even and perfect diffusion of the color, the fabric is again pumiced and coated with fine lacquer. The flesh side of the leather is prepared in the same manner by using an oil or aqueous mixture, according to the purpose for which the fabric is to be used. The first is prepared by adding white lead ground in linseed oil of the consistency of syrup, and reducing this with oil of turpentine, so that it can be conveniently applied to the tissue, coating it several times. The aqueous mixture consists of gelatine, gum paste, solution of gutta-percha, or of caoutchouc. Whatever the mixture applied, dust of cotton, silk, woollen, or leather is sifted over it and allowed to dry, when the particles not adhering are removed by brushing.
—*The Techno-Chemical Receipt Book*, ed. by William T. Brannt and William H. Wahl. Philadelphia: Henry Carey Baird & Co., 1892.

ALCA NEWS

Proceedings, Reports, Notices, and News

of the

AMERICAN LEATHER CHEMISTS ASSOCIATION

OFFICERS

President—E. B. Thorstensen, S. B. Foot Tanning Company, Red Wing, Minnesota

President-Elect—Mieth Maeser, United Shoe Machinery Corporation, Research Division, Beverly, Massachusetts

Secretary-Treasurer—Fred O'Flaherty, Department of Leather Research, University of Cincinnati, Cincinnati 21, Ohio

Council

E. Daniel Lord, J. S. Barnet and Sons, Inc., 128 Boston Street, Lynn, Massachusetts.

Charles A. Martin, E. Hubschman and Sons, Inc., 415 North Fourth Street, Philadelphia 23, Pennsylvania.

Harold R. Miller, Jr., Organic Chemicals Department, E. I. du Pont de Nemours & Company, Inc. Wilmington 99, Delaware.

C. David Wilson, Fred Rueping Leather Company, Fond du Lac, Wisconsin.

Frank Zeissig, Hiteman Leather Company, West Winfield, New York.

PAST PRESIDENTS OF THE A.L.C.A.

G. A. Kerr, W. H. Teas, H. C. Reed, J. H. Yocum, F. H. Small, H. T. Wilson, J. H. Russell, F. P. Vetch, W. K. Alsop, L. E. Levi, C. R. Oberfell, R. W. Griffith, C. C. Smoot, III, J. S. Rogers, Lloyd Balderston, J. A. Wilson, R. W. Frey, G. D. McLaughlin, Fred O'Flaherty, A. C. Orthmann, H. B. Merrill, V. J. Mlejnek, J. H. Highberger, Dean Williams, T. F. Oberlander, A. H. Winheim, R. M. Koppenhoefer, H. G. Turley, E. S. Flinn.

EMPLOYMENT NOTICES

WANTED: Leather Finish Demonstrator—Well-established manufacturer of finishes and dressings has opening for a salesman-demonstrator. Please describe territory preferred. Can be full time or part time. Box JA-20, c/o Secretary, American Leather Chemists Association, University of Cincinnati, Cincinnati 21, Ohio.

WANTED; Leather Sales Demonstrator—Attractive opening and opportunity with established and well-known chemical firm. Position requires person with demonstrated practical background and technical understanding of tannery wet work; preferably with sales experience. College training desirable. Extensive travelling. Liberal starting salary commensurate with qualifications. Complete benefit program. Kindly submit résumé outlining background, including salary objective, to Box RT125, c/o Secretary, American Leather Chemists Association, University of Cincinnati, Cincinnati 21, Ohio.

COUNCIL MEETING MINUTES

January 10, 1958
Plankinton House
Milwaukee, Wisconsin

The meeting was called to order by President Thorstensen at 10:00 A.M. All officers and Council members were present except Mr. Zeissig. The visitors included Messrs. E. D. Compton, R. Stubbings, C. Retzsch, O. Wederbrand, and H. B. Merrill.

The minutes of the Council meeting held October 16 were read and approved after one correction. Dr. W. Windus is to succeed Dr. I. Clarke as chairman of the Hide Powder Committee, and Fred Luvisi is to be a member of the same committee.

Technical committee reports.—President-Elect Maeser submitted mimeographed copies of each committee chairman's report to each member of Council. The reports were approved, but before being submitted for publication they will be edited by Mr. Maeser.

Upon motion by C. David Wilson, seconded by Mr. H. Miller, it was moved and approved unanimously by Council that the Industrial Waste Committee be requested by the Technical Coordinator to develop methods of evaluating and testing tannery effluents, with the final goal being the publication of such methods in the Methods Booklet.

Editor's report.—Dr. H. B. Merrill reported on the material published and the present status of the *Journal*. His report is as follows:

"In 1957 we published 724 pages, compared to 745 in 1956, broken down as follows:

	1957		1956	
	No.	*Pages*	*No.*	*Pages*
Papers and technical reports	36	433	43	445
Abstracts, including patents	429	125	323	109
Book reviews	6	4	15	6
News items, notices, biographical notes, and miscellaneous	—	111	—	114
Title pages and indexes	—	51	—	71
		724		745

"We published seven fewer papers, but over 100 more abstracts, in 1957.

"The influx of acceptable papers has improved to some extent. After providing for the January, February, and March numbers of the current year, we have on hand three acceptable papers besides five others that have been returned to the authors for more or less complete revision. No less than six papers presented at the Lake Placid meeting have not yet been submitted for publication.

"During the last year we moved the Table of Contents off the cover, replacing it with photographs or a conventional design. This change seems to have found favor. In the future we probably shall use photos only when they have current news value."

Dr. T. C. Thorstensen, the Associate Editor, served very capably as Dr. Merrill's substitute during a period of about two months. Dr. Koppenhoefer resigned from the Editorial Board, and Dr. Wallace Windus was appointed to fill the vacancy thus created. Dr. Merrill took this opportunity to thank the members of the board and our abstracters for their cooperation and assistance.

Dr. Merrill also noted that the new Council will have to consider his successor.

This report was accepted with appreciation and approval by Council.

Convention committee.—Clinton Retzsch, chairman, submitted the following report and budget which upon motion by M. Maeser, seconded by H. Miller, were unanimously approved by Council.

COMMITTEE MEMBERS

Chairman	C. E. Retzsch
Vice Chairman	R. Stubbings
Entertainment	J. Casnocha and F. Klimpl
Hotel and Transportation	H. Bernard
Golf	M. Lindsay
Publicity	J. Stellmach
Ladies' Activities	Mrs. H. Bernard

PROPOSED AGENDA

Sunday, May 25

Council and Committee Meetings
President's Reception

Monday, May 26

Morning	Technical Papers
Afternoon	Golf Tournament
Evening	Entertainment and Dancing

Tuesday, May 27

Morning	Technical Papers
Afternoon	Technical Papers
Evening	Banquet

Wednesday, May 28

Morning	Leather Making Discussion
Afternoon	Finish of Discussion
	Council Meeting

PROPOSED BUDGET

Receipts

Member registration—325 at $8.00	$2,600.00
Nonmember registration—40 at $15.00	600.00
Display Rental	1,000.00
	$4,200.00

Expenditures

Registration	$ 300.00
Transcription	550.00
Public address	100.00
Presidential reception	1,200.00
Banquet speaker	500.00
Entertainment	900.00
Golf tournament	350.00
Ladies' entertainment	300.00
	$4,200.00

Mr. Retzsch further reported that progress was being made and that he now was soliciting papers.

The question of avoiding conflict for persons who desire to attend more than one committee meeting on the Sunday preceding the Annual Meeting was left to Messrs. Retzsch, Stubbings, and Maeser.

It was agreed that Council will hold a meeting at breakfast on Monday, May 26.

Mr. Wederbrand reported that he had a total of eight booths subscribed for and that he would use every effort to get more.

The following budget for 1958 was submitted for Council's consideration. Upon motion by Mr. Wederbrand, seconded by Mr. Maeser, the budget was unanimously approved.

BUDGET FOR 1958

	1957 Proposed	1957 Actual	1958 Proposed
General Account: Income			
Dues	$11,500.00	$11,592.00	$11,600.00
Interest on United States Bonds	1,100.00	1,205.00**	1,150.00
Methods	20.00	73.00	50.00
Annual Meeting	–0–	–0–	–0–
Directory	800.00	770.66	750.00
Total	$13,420.00	$13,640.66	$13,550.00
General Account: Expense			
Executive Secretary's Office	$ 4,600.00	$ 4,600.00	$ 4,600.00
Secretary's Office Expense	1,200.00	1,117.34**	1,200.00
Annual Meeting	400.00	275.16	400.00
Committee Work	100.00	97.80	100.00
Council Meeting	100.00	158.90	100.00
Audit	200.00	200.00	200.00
Printing of By-Laws & Methods	400.00	–0–	400.00
Printing of Directory	925.00	894.67	925.00
Reserve for Uncollectible Accounts	400.00	323.00	400.00
Winheim Award	100.00	100.00	–0–
Total	$ 8,425.00	$ 7,766.87	$ 8,325.00
Surplus on General Accounts	**$ 4,995.00**	**$ 5,873.79**	**$ 5,225.00**
Journal Account: Income			
Advertisements	$11,500.00	$12,326.68	$12,350.00
Subscriptions	5,400.00	6,223.39	6,250.00
Journals, Volumes, Reprints	2,400.00	1,855.49	1,800.00
Dues, S.L.T.C., Difference	800.00	943.75	900.00
Total	$20,100.00	$21,349.31	$21,300.00

**Estimated figures.

BUDGET FOR 1958 (Continued)

	1957 Proposed	1957 Actual	1958 Proposed
Journal Account: Expense			
Printing and Publishing	$18,000.00	$19,921.15	$19,500.00
Printing Reprints	2,400.00	1,666.43	2,000.00
Copyright, Insurance, Storage	500.00	460.00	500.00
Abstracts & Translations	400.00	294.19	400.00
Editor-in-Chief Compensation	600.00	600.00	600.00
Editor-in-Chief Office Expense	400.00	199.64	400.00
Managing Editor Compensation	2,500.00	2,500.00	2,500.00
Managing Editor Office Expense	300.00	191.05	300.00
Advertising Discount Allowed	150.00	126.06	150.00
Total	$25,250.00	$25,958.52	$26,350.00
Deficit on Journal Account	**$ 5,150.00**	**$ 4,609.21**	**$ 5,050.00**
Difference	**$ 155.00**	**$ 1,264.58**	**$ 175.00**
	(Deficit)	**(Surplus)**	**(Surplus)**
Reserve for delegate to attend International Meeting		$ 1,000.00	$ 1,000.00

The Nominating Committee presented the following slate of candidates for the coming election:

PRESIDENT-ELECT

R. G. Ashcraft
R. G. Henrich

MEMBERS OF COUNCIL

Malcolm H. Battles
James M. Cassel
Clinton E. Retzsch
Ian C. Somerville

This slate was prepared by the committee composed of Robert M. Lollar, chairman, N. C. Benrud, and Carl Telander. Upon motion by Mr. Lord, seconded by Mr. Miller, the slate was approved by Council.

Advertising.—A special panel consisting of President Thorstensen, Oscar Wederbrand, and Fred O'Flaherty will consider the advertising.

New members.—The following members were approved for active membership: Theone C. Cordon, J. Walter Giffee, Alfred H. Korn, Peter Lowenstein, Jerayr Manikian, Frank P. Russell, and Joseph W. Theil.

Members resigned.—The following members have sent their resignation: T. R. Aldrich, Jr., Don Carter, William Conn, Clarence Fiedler, Matthew Gallop, Thomas Greaves, E. R. Lobaugh, Louis Pine, Peter Plambeck, Fred Thayer, and George Twitchell.

Members dropped.—The following members were dropped for nonpayment of their 1957 dues: N. M. Adams, Ralph V. Andes, Raymond Berg, Thomas E. Billington, Irving Braum, C. H. Bronson, Joseph W. Brown, Yves Cara, Jacques A. Daoust, Don Ireno Duran, Inocencio Gonzales, Howard L. Gottleib, Gulsaid Khan, Paul Lipsitz, Estaban Liscano, Chenhsiang Lo, H. E. Norwood, Douglas Ramsay, Jurgen E. Simon, Leroy Simon, Robert Sohn, Frank F. Stamberg, Joseph Weger, and Charles Weir.

Deceased members.—The following members have passed away during 1957: A. Harvey, J. R. Mahle, William McCreary, Paul Schotte, Dickson Stauffer, and Albert J. Mahoney.

Committee organization.—Upon motion by Mr. Wilson, seconded by Mr. Maeser, it was agreed that approval of any new appointments or changes in technical committees could be submitted to Council by mail ballot.

Meeting in 1959.—Mr. Wederbrand reported that the only place for display booths would be along the sides and rear of the meeting room. Council agreed to leave this in the hands of the Convention Committee.

Public address equipment.—The Secretary was instructed to determine at what price the presently owned public address system could be sold and that this be submitted to Council for action.

Adjournment.—There being no further business, the meeting was adjourned.

Respectfully submitted,

FRED O'FLAHERTY, *Secretary*

FIFTY-FOURTH ANNUAL MEETING

May 25–28, 1958

The New Ocean House, Swampscott, Mass., will be the scene of the Fifty-fourth Annual Meeting of the Association, May 25–28, 1958. As this is the fourth time that we have convened at Swampscott, the place is familiar to many of our members. The New Ocean House is located right on the shore of the Atlantic Ocean, on the exclusive North Shore of Massachusetts, 20 miles north of Boston. Swampscott can be reached by rail from Boston's North Station (about 25 minutes) or by automobile from Boston's Logan International Airport (20 minutes). The hotel, on request, will arrange to

NEW OCEAN HOUSE, SWAMPSCOTT, MASS.

send a car to the airport ($5 for one to three passengers; $1 each for additional passengers).

The entire membership of last year's convention committee generously agreed to serve for another year. The committee is made up of: Clinton E. Retzsch, *Chairman*; Robert Stubbings, *Vice-chairman*; Joseph J. Stellbach, *Publicity*; Harold Bernard, *Hotels and Transportation*; Mrs. Harold Bernard, *Ladies' Activities*; Joseph A. Casnocha and Fred Klimpl, *Entertainment*; Marden I. Lindsey, *Golf*.

The technical program is still in the formative stage but definitely will include an all-day symposium on practical tanning. The subject will be "Chrome Tanning". Dr. R. G. Henrich is Chairman of the Symposium Committee and will serve as panel moderator. Other members of the panel are J. Thomas Chain, E. D. Lord, A. G. Fleisch, G. H. Meyer, F. W. Panepinto, and possibly one or two more.

Sports facilities include a private beach on the ocean, a 1000-yard golf course, playing privileges on six other nearby courses, riding, boating, fishing, and tennis.

No part of our country is richer in historic interest than Boston, the "Hub of the Universe", and its surroundings. Neighboring towns, 5 to 65 miles from Swampscott, include Salem, a quaint historic town founded in 1626; Marblehead, the birthplace of the American Navy; Gloucester, the largest fishing port in America; Cambridge, seat of Harvard University; Lexington and Concord; and Plymouth, landing place of Mayflower I.

ABSTRACTS

Preparation of Synthetic Tannins by Mixed Condensation of Sulfonated and Unsulfonated Components. G. Reich. *Das Leder*, **7**, 289–97 (1956).—Aromatic syntans are prepared by (1) sulfomethylation of hydroxyaryl compounds with aldehydes either in amount (*a*) equivalent to the SO_2 used, or (*b*) in excess; (2) amphoterization of hydroxyaryl compounds with (*a*) aromatic amines, (*b*) alkanolamines, or (*c*) ammonium salts; (3) sulfonation of (*a*) aromatic compounds and self-condensation of these with formaldehyde, (*b*) aromatics and condensation with unsulfonated hydroxyaryls (but also polysulfones, sulfodepsides or sulfonimides) by aldehyde through carbon bridges; (*c*) aldehyde-condensed hydroxyaryls (novolaks). Condensations were made in an infrared-heated, 3-neck flask fitted with a stirrer, reflux condenser, and thermometer. Beta-naphthol was sulfonated by heating 1 mol and 1.2 mols of sulfuric acid for 1 hr. at 120°C. This sulfonic acid, diluted with 150 ml. of water, was condensed with variable amounts of phenol, pyrocatechol, and dioxy (4, 4 prime-dihydroxydiphenylsulfone) by addition of 30% HCHO at 95°C. and at the rate of 0.2 mols per min. Before each addition of HCHO the solubility of the product was tested. If it gave clear 0.1, 1, and 10% solutions (naphthol basis) both hot and cold, no more HCHO was added. The mixture was stirred for 0.5 hr. at 100°, then cooled and bottled. The products were analyzed for tannin by the filter method after adjustment to pH 3.5; tan and combining values were also determined. A maximum of 3 mols of phenol were condensed with 1 mol of naphtholsulfonic acid and required 3 mols of HCHO. Optimum tanning properties were found with 1.5–2.5 mols of phenol. The product with 3 mols of phenol made leather with a very cracky grain. With increasing amounts of pyrocatechol (up to 6 mols) fuller leather was obtained. Only 5.2 mols of HCHO were required, showing that there was self-condensation of the catechol. The product with 0.75 mol of dioxy and 1.6 mols of HCHO made full, firm leather. The greater HCHO requirement can only be explained by cross-bonding (Resol type of product) or by formation of stable methylol groups. With 0.5 mols of phenol at pH 2 or below, the product had a strong red color which could be ascribed to a condensation of the naphtholsulfonic acid with HCHO. The mechanism of the reaction was studied by partially precondensing one of the components. If not more than half of the phenol was precondensed with HCHO (to novolak), then condensation was continued with Schaeffer's acid and a good, soluble product was obtained. Greater precondensation resulted in insoluble products that could not be further condensed nor made soluble. Precondensed products all had higher viscosities than those made by the one-step method; the temperature change of viscosity, however, was the same for products made by either method. Precondensing more than one fourth of the Schaeffer's acid results in insoluble products on further condensation with phenol. In the one-step process phenol condenses to novolak to which Schaeffer's acid attaches and breaks the chain. Precondensing the latter decreases the amount so that the novolak chains are not terminated in time to be made soluble by the acid. Separation of the various components in the condensation mixtures would be very difficult, so a gross separation was made into 2 parts. Unsulfonated material was removed from the mixed condensate by exhaustive 8-hr. extraction with ether. Over half of the products dissolved. The ether extract of the phenol–Schaeffer's acid condensation product gave a red, cloudy solution in water.

Even the dispersed portion contained sulfur; therefore there is practically no pure phenolnovolak in the condensate, and novolak condensed with naphtholsulfonic acid is soluble in ether if the degree of sulfonation is small enough. The ether extract of the pyrocatechol product gave a brown, opalescent, aqueous solution, and was almost sulfur-free. Considerable unsulfonated catechol condensate was therefore present in the mixed condensate. The ether extract, originally water-soluble, became insoluble on drying at 100°, showing that the catechol condensed further. The pyrocatechol condensate contained reactive methylol groups that were responsible for its solubility. Much of the dioxy was recovered from the ether extract and had not reacted with the HCHO. The combining value is determined by the amount of low sulfonated, astringent portion. Extraction with ether halved the combining value of the phenol product but lowered that of the catechol product very little. Salting-out experiments showed that the mixed condensate with phenol had an equivalent weight of 350–720 with 40% having an equivalent weight of 640. This indicates that 4–5 mols of phenol had condensed with 1 mol with naphtholsulfonic acid. The equivalent weights of the dioxy and pyrocatechol products were 300–400. A complete syntan with good tanning properties will result only if 1 mol of naphtholsulfonic acid and at least 1 mol of unsulfonated hydroxyaryl are united by HCHO to give a homogeneous, water-soluble product. Such a product can be formed either by a true condensation or by dispersion, depending on the properties of the unsulfonated component. Phenol and cresol give true condensation products; for this it is necessary that the sulfonic acid and phenol have approximately the same reactivity to HCHO. With some sulfonic acids the reactivity favors phenol, so that insoluble novolaks predominate. Tanigan extra D illustrates how reactivity may be modified. Phenolsulfonic acid is precondensed to an assist tannin, partly neutralized, and cooled so that the reactivity of the phenol is so reduced that novolaks are not formed. In makng Tanigan SK, phenol is reacted with HCHO in alkaline solution and the phenolalcohols so formed are added to acid-precondensed naphthalinesulfonic acid. Pyrocatechol reacts with HCHO to give easily dispersible, soluble substances. If the catechol is used as an unsulfonated component, a satisfactory tannin is not obtained, unless the sulfonic acid component is precondensed. Ligninsulfonic acid is high-molecular and should not be further condensed. It is valuable for mixed condensates with the HCHO reaction products with catechol or dihydroxydiphenylsulfone. In weakly alkaline solution the desired product is obtained without appreciable self-condensation of the ligninsulfonic acid (Tanigan extra A). Pyrocatechol reacts with HCHO at pH 3–4 to give a dispersible product so that a one-step process is possible (Pellutan G 40). From the known reactivities of the individual compenents the behavior during a mixed condensation can be predicted, and optimum conditions can be obtained by adjusting concentrations, pH values, and temperature. I.D.C.

Amino Acid Sequences of Collagen. I. The Position of Proline and Hydroxyproline. W. Grassmann, K. Hannig, H. Endres, and A. Riedel. *Hoppe-Seyler's Z. physiol. Chem.*, **306**, 123–31 (1956).—The digestion of collagen or procollagen with crystalline trypsin yields mixtures of peptides of average chain length 18 amino acid residues. On continuous electrophoresis at pH 4.9 such digests of collagen and procollagen yield similar fractions, indicating a far-reaching similarity in chemical structure. From a digest of procollagen 11 individual peptides were isolated which were indicated to be homo-

geneous by the fact that they could not be further fractionated by electrophoresis at 3 pH values (2.3, 4.9, and 9.2) or by chromatography in 4 different solvent systems, and that amino acid analyses gave stoichiometric proportions of all residues. The chain lengths ranged from 3 to 79 residues, and in each case glycine made up approximately one-third of the total. This suggests a fairly uniform distribution of glycine over the entire collagen chain. Peptides with a high content of basic and dicarboxylic acids were mostly lacking or poor in proline and hydroxyproline, and those rich in the latter were poor or lacking in the former. This is in agreement with the concept of alternating imino acid rich apolar and imino acid poor polar regions, which possibly correspond respectively to the light and dark bands observed in the electron microscope. The peptide with the highest imino acid content was further investigated. The amount isolated corresponded to 1.6% of the weight of procollagen, or 1.55% of its total N. It contained 43 or 44 amino acid residues, corresponding to a molecular weight of 3916 or 4002. Of the residues, 14 were glycine, 15 proline or hydroxyproline, and the remainder other amino acids. End-group determinations showed the N-terminal residue to be glycine, and the C-terminal residue to be aspartic acid (not in the amide form). It was also shown that neither proline nor hydroxyproline occurs among the first 5 or 6 residues at each end of the chain. The imino acids, together with glycine and certain others, therefore belong to the central part of the chain, whose structure may be represented as: H_2N-gly(ser, thr, leu, ala, gly)-(10pro, 5hypro, 12gly, 2ala, 1 · 2ser, 2tyr, 1glu)-phe-glu-leu-asp-asp-COOH. This provides a strong confirmation of the findings of Schroeder *et al.* (*J. Am. Chem. Soc.*, **76**, 3556 [1954]) and of Kroner *et al.* (*Ibid.*, **77**, 3356 [1955]) and appears to prove the existence of ordered regions about 30 amino acid residues in length and containing the sequence -gly-pro-hypro-gly- postulated by these authors. J. H. Highberger

The Estimation of Tannins in Black Wattle Barks and Commercial "Mimosa" Extracts. Part II. Statistical Comparison of the Official Hide Powder (Shake) Method and Photometric Methods of Tannin Analysis. D. G. Roux, *J. Soc. Leather Trades' Chemists*, **41**, 275–86 (1957).—Statistical comparison by analysis of variance of 94 duplicate bark analyses showed that the ultraviolet spectrophotometric and official hide powder method of tannin estimation did not give significantly different results. Comparison of analyses by each method over 132 bark samples varying in tannin content from 17–41% shows high over-all agreement between methods but individual differences as high as 3% and 4% in actual value. Inherent differences between methods are mainly responsible for observed variations. The adoption of the ultraviolet method as useful alternative to the official hide powder procedure would appear to have little over-all effect on black wattle tannin estimation. **Part III. A Critical Examination of the Official Hide Powder Method.** D. G. Roux. *Ibid.*, 287–300.—Causes of the differences existing in a relatively low percentage of analyses between the ultraviolet spectrophotometric method and the official hide powder tannin method were investigated by studying the affinity of the major fractions of black wattle extract toward hide powder. The spectrophotometric method measures only phenolic content of tannins and is unaffected by the presence of gums, starches, and sugars. Of the variable proportion (5–12%) of alcohol-insolubles or gums in wattle extract 55–81% react as tannins toward hide powder. However, these gums do not contribute to actual tanning of a hide. A partial balance between loss of a low proportion

of wattle polyphenols and the absorption of a high percentage of gums in the hide powder method, and standardization of the ultraviolet against the hide powder method account for the high correlation between methods. For purposes of tannin estimation the photometric method differentiates more faithfully between "tannins" and "nontannins" than the hide powder method and is faster. J.M.C.

A Comparison of the Results of Estimating Black Wattle Tannin by the Official Hide Powder Method and by a Proposed Ultraviolet Spectrophotometric Method. C. G. Gordon-Gray. *J. Soc. Leather Trades' Chemists*, **41**, 269–75 (1957).—To compare the S.L.T.C.A. official hide powder method of tannin analysis with the ultraviolet spectrophotometric method of Roux (*JALCA*, **47**, 294 [1952]) extracts made from 94 black wattle bark samples as well as some green and silver wattle samples were analyzed by the two methods. Less than 1% difference between the two methods was obtained in 60 samples of black, but 18 of 19 silver wattle bark samples showed greater differences, differences ranging as high as 6%. The ultraviolet spectrophotometric method of analysis is very reproducible, but the results do not always agree with or bear the same relation to the official hide powder method. J.M.C.

Colour Index Cross Indices. *American Dyestuff Reporter*, **46**, P610–24, P655–73 (1957).—While cross indices between the older and the present editions of the *Colour Index* will appear in Part III, this volume will not be published for several months. To aid current use of the new *Colour Index* AATCC has prepared three cross indices which are published on these pages as a service to all who are active in the field of dyes. R.M.L.

Synthesis of Tanning Agents of the Sulfonation Novolak Type. D. V. Tishchenko and I. P. Uvarov. *Zhur. Priklad. Khim.*, **30**, 104–14 (1957); *Chem. Abstr.*, **51**, 10105*d*.

Three Types of Gelatin. W. M. Ames. *J. Soc. Food Agr.*, **8**, 169–73 (1957); *Chem. Abstr.*, **51**, 10106*e*.

Quantitative Application of pH Measurements in Analytical Chemistry. H. Freiser. *Am. Soc. Testing Materials, Spec. Tech. Pub.*, **190**, 65–70, discussion 71–72 (1956); *Chem. Abstr.*, **51**, 9397*h*.

Colorimetric Determination of Secondary Amines. C. F. Cullis and D. J. Waddington. *Anal. Chim. Acta.*, **15**, 158–63 (1956); *Chem. Abstr.*, **51**, 9418*h*.

Molecular Organization in Keratins. I. Introductory Survey. R. D. B. Fraser and T. P. MacRae. *Textile Research J.*, **27**, 379–84 (1957). **II. Densities of Native Keratins**. *Ibid.*, 384–90; *Chem. Abstr.*, **51**, 5729*a*.

Evidence of Regularities in the Chemical Structure of Keratins. R. D. B. Fraser and T. P. MacRae. *Nature*, **179**, 732–33 (1957); *Chem. Abstr.*, **51**, 9730*f*.

X-Ray Diffraction Pattern and α-β Transformation of a Protein Extracted from the Human Epidermis. D. A. Roe and A. N. J. Heyn. *Nature*, **179,** 266–67 (1957); *Chem. Abstr.*, **51,** 9735*f*.

The Identification of Dyes on Fibers. A. Bode. *Melliand Textilber.*, **38,** 289–96 (1957); *Chem. Abstr.*, **51,** 10063*f*.

Wax Polish Technology and Testing Methods. C. L. Jones. *Paint Technol.*, **21,** 43–48 (1957); *Chem. Abstr.*, **51,** 10095*d*.

Unique Complex Change in Basic Chromium Chlorides on Their Interaction with Collagen. K. H. Gustavson. *Chemistry and Industry*, **1957,** 1070–72.—Dilute solutions of basic Cr chlorides contain no complexly bound Cl, yet the Cr complexes fixed by collagen from such solutions contain considerable quantities of complexly bound Cl. These facts, long known and hitherto unexplained, can now be understood in the light of the work of Pontius, Kaplan, and Husney (*J. Phys. Chem.*, **60,** 9 [1956]) on the interaction of certain dyes with gelatin. These authors found that an extremely high concentration gradient is set up in the surface layers of the substrate. The concentration of the dyestuff in the gel was about 20 times that in the external solution. If a similar concentration gradient is set up between the surface layers of collagen and the external solution in the case of Cr chloride liquors, then the high concentration of the Cr salt in the surface layers accounts for the formation of complexes containing nonionic Cl. H.B.M.

Rontgenogram of Collagen. M. I. Millionova and N. S. Andreeva. *Biofizika*, **2,** 43–45 (1957); *Chem. Abstr.*, **51,** 10624*e*.

Enzymic Unhairing Material. I. Physical and Histological Changes of the Hides by the Treatment. K. Kondo. *Sci. Repts. Hyogo Univ. Agr. Ser. Zootech. Sci.*, **2,** 59–62 (1956); *Chem. Abstr.*, **51,** 10935*b*.

Pyroligneous Liquor as Tanning Material. I. Tanning Properties of a Distilled Pyroligneous Liquor. K. Ito. *Sci. Repts. Hyogo Univ. Agr. Ser. Zootech. Sci.*, **2,** 57–58 (1956); *Chem. Abstr.*, **51,** 10935*b*.

Waste Water from Leather Factories. H. Scholz. *Osterr. Wasserwirtsch.*, **8,** 319–25 (1956); *Chem. Abstr.*, **51,** 10935*f*.

Tanning Leather with Aluminum Compounds in Combination with Chromium. L. B. Sankin and I. P. Strakhov. *Tanner* (India), **12,** 51–54 (1957).—Liquors were prepared by mixing alum, or alum plus HCOONa, with $K_2Cr_2O_7$ plus H_2SO_4, and reducing with glucose, or by mixing alum solution with reduced chrome liquor and boiling. In all cases the liquors contained equimolecular quantities of Cr and Al, and the basicity was near 33%. Leathers tanned with 2% of (Cr_2O_3 + Al_2O_3) on the limed weight were boil-fast and contained 3.7–4.0 Cr_2O_3 and 3.6–4.7 Al_2O_3 per 100 collagen. Fixation was best from the liquors containing formate. The Al_2O_3 contained in the leathers was much more resistant to washing than that in a leather tanned with alum only. This is considered to be evidence for the formation and fixation by hide of mixed Cr-Al complexes. However, when the leathers were treated with oxalate, all

the Al was removed and only about half the Cr. The partial replacement of Cr by Al in tanning is believed to be practicable. H.B.M.

White Leather Tannages. G. W. Douglas. *Tanner* (India), **12,** 13–20 (1957).—A description of tannages employing alum, formaldehyde, zirconium, and resins. H.B.M.

New Gluing Materials for Shoe Manufacture. B. Y. Kazanovich. *Tanner* (India), **12,** 46, 49 (1957).—Casein glue was replaced by 1:1 casein-synthetic latex (to save casein), and "Perchlorvinyl" glue was replaced by polymethacrylate for hygienic reasons. H.B.M.

Chemistry of Chloroaquochromium (III) Ions in Acid Media. B. Zemel. *Univ. Microfilms. Publ.*, No. 21378, 123 pp.; *Dissertation Abstr.*, **17,** 1209–10 (1957); *Chem. Abstr.*, **51,** 13633*d*.

Proteins and Their Degradation Products. IX. Building Block Sequences—Analysis of Collagen. K. Heyns and W. Königsdorf. *Z. Physiol. Chem.*, **295,** 244–63 (1953); *Chem. Abstr.*, **51,** 13959*h*.

New Ideas on the Relations between Chemical Structure and Tanning Action. N. G. Sucitulescu. *Ind. Usoara*, **3,** 483–90 (1956); *Chem. Abstr.*, **51,** 14305*c*.

Synthetic Fats and Greases in the Leather Industry. M. Ceamis. *Ind. Usoara*, **4,** 11–14 (1957); *Chem. Abstr.*, **51,** 14306*h*.

Shrinking of Collagen Membranes. A. Buzogh, J. Szönyi, and A. Szecsi. *Kolloid-Z.*, **131,** 12–14 (1957); *Chem. Abstr.*, **51,** 14378*b*.

Conductimetric Titration and the Structure of Chromium Complexes. J. E. Bolzan. *Rev. Fac. Cienc. Quim. Univ. Nacl. La Plata.*, **28,** 79–94 (1953-54); *Chem. Abstr.*, **51,** 14461*e*.

Determination of Carbohydrates as Ozazones (in Collagen and Procollagen). W. Grassmann, H. Hörmann, and R. Hafter. *Z. Physiol. Chem.*, **307,** 87–96 (1957) (English summary); *Chem. Abstr.*, **51,** 14489*g*.

Collagen. X. Modifications Produced in *in Vitro* Combinations of Collagen - Mucopolysaccharide. S. Bazin and A. Delaunay. *Ann. Inst. Pasteur*, **92,** 459–65 (1957) (English summary); *Chem. Abstr.*, **51,** 14846*b*.

Utilization of Bark. I. Index to the Bark Literature. J. E. Marian and A. Wissing. *Svensk Papperstidn.*, **59,** 751—58, 800–5, 836–37 (1956); **60,** 45–49, 85–87, 124–27, 170–74, 255–58, 348–52, 420–24, 522–23 (1957) (In English). **II. Investigation of the Stiasny Reaction for the Precipitation of Polyphenols in Pine Bark Extracts.** A. Wissong. *Ibid.*, **58,** 745–50 (1955) (In English); *Chem. Abstr.*, **51,** 15119*a*.

Tannins — Their Occurence and Significance. T. White. *J. Sci. Food Agr.*, **8,** 377–85 (1957); *Chem. Abstr.*, **51,** 15161*g*.

Determination of Particle Size in Aqueous Suspensions of Quebracho Tannin. C. L. Miniussi. *Rev. Fac. Cienc. Quim. Univ. Nacl. La Plata.*, **27,** 119–29 (1952) (Pub. 1955); *Chem. Abstr.*, **51,** 15161*g*.

Prevention of Stains on Leather Tanned with Phenolic Syntans. K. S. Toporovskaya and A. N. Mikhailov. *Legkaya Prom.*, **16,** No. 8, 19–22 (1956); *Chem. Abstr.*, **51,** 15162*e*.

Influence of Treatment with Sulfur on the Properties of Tanned Leather. L. V. Matveeva and A. N. Mikhailov. *Legkaya Prom.*, **17,** No. 5, 26–27 (1957); *Chem. Abstr.*, **51,** 15162*f*.

Inflation Method of Flaying. Anon. *Leather Trades Review*, **125,** 396–97 (1957).—Sheep- and goatskins from Nigeria, Sudan, Aden, and Libya which are flayed by the inflation method show almost complete absence of knife damage. The method is described and shown by photographs. J.J.

Dehairing of Hogs. F. L. DeBeukelaer and H. Wang. *Leather Mfg.*, **74,** No. 9, 6 (1957).—Moderate revision in dehairing procedure for hogs will bring about a material improvement in results and virtually eliminate the need for singeing and shaving of carcasses. A scalding vat temperature above 140°F. should be avoided, and exposure at 140°F. should not exceed 4 minutes. At 136°F. an exposure of 10 minutes may be employed. Dehairing results are dependent on seasonal changes in the hair. Should seasonal factors require modification of scalding time and temperature conditions, consideration should be given to increasing vat capacity. Singeing and excessive shaving should be avoided in those areas suitable for conversion into leather, namely, the whole side from backbone line to belly edge between the ham and the shoulder. Further research is needed to define the conditions conducive to the most satisfactory results for each season. Pork packing companies may find it profitable to experiment with scalding time and temperature variations within the limits outlined. Excessive exposure to too high a scalding temperature produces poor-quality skins and increased dehairing difficulties. A proper operating balance in time and temperature must be maintained. J.J.

The Problem — A Review of the Salient Facets of Cattle Grub Infestation. F. O'Flaherty. *Leather Mfg.*, **74,** No. 9, 14 (1957).—Grub infestation has been with us for a long time. Virgil and Shakespeare refer to warble fly infestation. We now have a rather complete picture of the life cycle of the grub parasite. The distribution of this parasite is almost world-wide. In the United States it exists in two forms: *Hypodermia lineatum* and *H. bovis*, *H. lineatum* being most prevalent in the southern and middle states and *H. bovis* in the northern states. The life cycle of *H. lineatum* is shown by photographs, graphs, and descriptions. Photographs show also the damage done to the hide. The effect on the animal and the monetary losses due to grub infestation are described. J.J.

The Particle-Size Analysis of Vegetable Tan Liquor. Y. Sakimoto and K. Katayama. *Bull. Japan Assoc. Leather Technol.*, **3,** 88–96 (1957) (English summary).—The influence of pH value and the blending of two different vegetable tanning extracts on the size and distribution of tannin particles was studied by a fractional centrifuging method. The tannin particles in solutions containing 5% solids were fractionated by means of an ordinary centrifugal separator and a Sharples supercentrifugal separator into 4 classes: (1) insoluble fraction ($> 1.0\mu$); coarsely dispersed (1.0–0.1μ); (3) colloidal (0.1–0.01μ); and (4) fine colloidal – crystalloidal ($<0.01\mu$). Single-component solutions of chestnut, wattle, soluble quebracho, and mangrove extracts, at their natural pH values and adjusted pH values, contained almost entirely particles of the fourth class, except for insolubles, and changes in pH value affected the ratio of these 2 fractions but not the other fractions. Peptization of insoluble matter was observed clearly in blends of wattle-mangrove (pH 4.1), soluble quebracho-mangrove (pH 4.7), and "Totanin"-mangrove (pH 2.3, 3.7, and 5.1). In the last case, the third and fourth fractions increased at all pH values; in the other two cases only the fourth fraction increased.

The Tanning Properties of *Pinus Radiata* Extract. G. W. H. Thompson and G. L. Amos. *Austral. J. Appl. Sci.*, **8,** 198–205 (1957).—Bark from freshly felled *P. radiata* was extracted at 90°C. in a 4-stage (later 5) countercurrent system, with addition of Na_2SO_3-$NaHSO_3$ (2% on bark weight) to the next to the last stage. Yield of soluble matter was disappointing. Pieces of hide were tanned in sets of 12 suspenders, spec. gr. 1.010–1.048, and 6 stronger liquors, spec. gr. 1.070. All the suspender liquors contained 25% myrabalans, and the stronger liquors 10%. The remainder of the tannin was wattle, or a blend of wattle and *P. radiata* extracts, (2 : 1 or 1 : 2). The sets were operated until equilibrium was established (3 months). *P. radiata* proved to be more astringent than wattle, as shown by slower penetration and greater tannin fixation in external layers compared to the center. Leathers tanned with blends containing *P. radiata* were red-brown. The blends contained a slicky sludge which adhered to the leather. H.B.M.

Storage of Decinormal Sodium Hydroxide Solutions in Polyethylene and in Soda-Glass Bottles. W. C. Easterbrook and A. B. Cameron. *Chemistry and Industry*, **1957,** 1155.—0.1 *N* NaOH stored in polyethylene showed no change in strength after 15 months, while storage in soda glass resulted in a 1% increase in strength. H.B.M.

Analysis of Used Fur Dyeing Baths. F. Brugger and L. Párizs. *Bör- és Cipötechnika.*, **6,** No. 2, 38–39 (1956); *Hungarian Tech-Abstr.*, **9,** 54 (1957).—A method suitable for the analysis of fur dyeing baths containing oxidation dyes was developed. The percentage of solids and ash content are not characteristic of the degree of exhaustion of the dye bath. The *p*-phenylenediamine content of the bath cannot be determined by direct kjeldahlometry since the measurement will yield lower than real nitrogen values. In order to obtain reproducible results the sample solution should be reduced by means of diluted sulphuric acid and metallic zinc before the wet combustion step. The phenol content of the bath was determined by the Koppeschaar method after a preliminary separation by steam distillation. The hydrogen peroxide content was measured volumetrically by titrating the iodine solution obtained by the

chloroform extraction of the iodine set free in the sample solution after acidification and addition of potassium iodide. It was found that the results were about 2% lower if *p*-phenylenediamine was present. The dye baths examined contained 0.2 to 0.4 g per liter of *p*-phenylenediamine, 0.5 to 0.6 g per liter of phenol and 0.12 to 0.16 g per liter of hydrogen peroxide after use.

The Effect of Various Organic Nitrogen Compounds on Unhairing with Lime Solutions. H. Toyoda, A. Futami, and K. Ishidi. *Bull. Japan. Assoc. Leather Technol.*, **3,** 79–87 (1957) (English summary).—The effect of various organic nitrogen compounds on the unhairing of goatskin and steerhide by lime solutions has been determined by measuring the loads required for unhairing. The following compounds accelerate unhairing: methyl-, dimethyl-, ethyl-, diethyl-, n-propyl-, n-butyl-, sec-butyl-, iso-butyl-, and iso-amyl amines, ethylene diamine, piperidine, ethanolamine, hydroxylamine, N(methyl) hydroxylamine, hydrazine, guanidine, aminoguanidine, and biguanidine. The effect of S(ethyl)thiourea in dissolving keratin is very great. The accelerating effect of these substances is related to their chemical structures to some extent and is not always parallel to their strengths as bases.

Sharkskin Leather. Anon. *Leather Trades Review*, **125,** 402 (1957).—There are 235 known species of shark, but only 10 or 12 (tiger, leopard, dusky, brown, surf, sand bar, blacklip, mackerel, hammerhead, sawfish, nurse, Japanese ray and Morocco sharks) are used for leather. The tiger, leopard, and nurse sharks are taken in greatest quantity and are the most valuable. The sheath of shagreen or rough skin of the shark is generally removed. The removal of the shagreeen is a special and difficult process in which care must be taken not to harm the quality of the skin. Running through the thick epidermal area of sharkskin is a cross weave of silken fibers which provides outstanding strength and resilience in flexing. J.J.

Mangrove Bark — Its Value as a Tanning Material. R. W. Pearman. *Leather Trades Review*, **125,** 315–16 (1957).—The name *mangrove* is applied to a number of trees: the *Rhizophoraceae* (most important), *Verbenaceae*, *Lythaceae*, and *Meliaceae*. The mangroves are noted for their abundance, wide distribution, and rapid growth. Natural agencies, such as wind, animals, insects, etc., do little damage to the mangroves. The tannin content of barks from different genera and species varies from less than 10% to more than 45%. Barks for export should contain at least 37% tannin. Special care and special apparatus are essential in the manufacture of mangrove extract of high quality. Mangrove extract is generally referred to as "cutch." Undesirable properties of mangrove as a tanning material are its astringency, objectionable dark red color, and high salt content. In recent years work has been carried out on the identification of the various constituents of mangrove extract, and this work has indicated the possible empirical formula to be $C_{32}H_{30}O_{12}$ or $C_{30}H_{26}O_{12}$ for mangrove extract. It is believed that when the chemistry of mangrove tannin is fully understood, it may be possible to find a method of completely obviating the undesirable red color and that with this undesirable quality removed, it will have wider application in the tanning industry. J.J.

The Question of the Existence of Reticulin in Animal Skin. A Critical Review of Recent Literature. A. Küntzel. *Das Leder*, **8,** 73–80 (1957).—

The terms "reticulin" and "reticular tissue" are used only in the leather field, not in medical or zoological histological-anatomical books. A clear distinction is not made between the morphological and chemical meaning of reticulin. Differences between collagen and reticulin in staining with picrofuchsin are caused by differences in thickness of the fibrils. There are morphological but no characteristic chemical differences between skin collagen and skin reticulin. The sheaths around collagen fiber bundles, which do not swell in acid or alkali, were first thought to be elastin, but they do not stain as elastin. They were later called reticulin by some workers. Collagen fibers swell by contracting in length and increasing in cross section. The sheath material will swell if it can contract lengthwise. Reticulin has been confused with pro- or precollagen, a soluble form of collagen that can be extracted with certain dilute organic solvents. Kramer and Little studied reticular tissue from kidney cortex with the electronmicroscope and concluded that reticulin consisted of collagen fibrils between which there was a large amount of amorphous cementing substance characterized by its glyco-proteid (mucoid) content. The apparent branching of reticulin and elastin observed in the light microscope is not seen with the electronmicroscope. In order to attain an unambiguous nomenclature the word "reticulin" should disappear from the vocabulary of leather histologists and chemists. I.D.C.

A Clarifying Note on the Reticulin Problem. K. H. Gustavson. *Das Leder*, **8**, 144–45 (1957).—In *The Chemistry and Reactivity of Collagen*, p. 79, Gustavson lists the 4 views of the nature of reticulin: (1) reticulin and collagen are two entirely different proteins; (2) reticulin is an early stage in the development of collagen, it is "procollagen"; (3) the two proteins are identical chemically, the difference being in the degree of subdivision; (4) reticulin is a complex between collagen and mucoprotein or polysaccharides. Küntzel has cited no. 2 out of context to illustrate this view, thus possibly giving the impression this was Gustavson's view, whereas he favors no. 4 and is in essential agreement with Küntzel. "Procollagen" presupposes a special collagen fraction that is a precursor of ordinary insoluble collagen. There are 3 kinds of soluble collagen: alkali-soluble, acid-soluble and neutral-salt-soluble. The Russians have retained the term for the citrate buffer-soluble material. One should avoid use of the term "procollagen". I.D.C.

Long-Chain Amines. Versatile Acid Extractants. F. L. Moore. *Anal. Chem.*, **29**, 1660–62 (1957).—The salts of long-chain amines, e.g., tri-*n*-benzylamine and methyl-di-*n*-octylamine, are almost insoluble in water but soluble in organic solvents. Inorganic and organic acids, including complex metal anions, are extracted from aqueous solution by shaking with a solution of the amine in chloroform. Zirconium was extracted quantitatively from 12*M* HCl by di-*n*-octylamine in xylene. There appears to be an analogy between liquid-liquid extraction with long-chain amines and anion exchange resins. The extraction method is fast, cheap, has higher capacity, and is easier to manipulate than a solid-liquid system. H.B.M.

Promising Australian Tannin Supply. Anon. *Leather Trades Review*, **125**, 263 (1957).—Preliminary investigation by the Australian Leather Research Association into the development of native sources of tannin indicate that the Monterey pine is a promising material due to its capability of rapid growth,

soft wood having excellent pulping properties, and bark containing 14 to 20% tannin. The tannin is catechol, somewhat red in color, unstable in the bark, and difficult to extract. It is hoped that it will be possible to upgrade the quality of the tannin to a point where the extract can be used in appreciable proportion in a sole leather blend. J.J.

Processing Unseasoned Tanniferous Woods. M. N. Krasukhin and A. N. Mikhailov. *Legkaya Prom.*, **15,** No. 3, 31–33 (1956); *Chem. Abstr.*, **51,** 13437*e*.

The Application of Polyamides to the Quantitative Analysis of Tannins and Their Substitutes. P. Y. Frenkel and A. N. Mikhailov. *Legkaya Prom.*, **16,** No. 12, 40–42 (1956); *Chem. Abstr.*, **51,** 13438*h*.

Tanning of Russian Leather with Pine Extracts. A. A. Dennisova and I. S. Shestakova. *Legkaya Prom.*, **17,** No. 3, 19 (1957); *Chem. Abstr.*, **51,** 13440*h*.

Moisture-conditioning Leather with Humidified Air. M. P. Zakharov, I. G. Maslov, and N. S. Khrennikov. *Legkaya Prom.*, **15,** No. 3, 25–27 (1956); *Chem. Abstr.*, **51,** 13442*f*.

Surface-active Agents in the Leather Industry. D. Burton and G. F. Robertshaw. *Congr. Mondial Detergence et Prods. Tensio-actifs, I^e Congr., Paris,* **2,** Sec. 5–11, 547–50 (1954) (pub. 1956). **The Interaction of Detergents with Collagen and Leather.** K. G. A. Pankhurst. *Ibid.*, 551–55. **The Use of Surface-active Materials as Leather Dyeing Assistants.** D. H. Tuck. *Ibid.*, 564–65. **Mutual Action of the Various-Type Surfactants and Leathers.** G. Otto. *Ibid.*, 566–70. **The Effect of Some Auxiliary and Fatliquoring Agents on the Dyeing of Glove and Velvet Leather.** C. Faure and H. Poinsard. *Ibid.*, 572–77; *Chem. Abstr.*, **51,** 13442–43.

The Interaction of Intermediates and Oxidizing Agents in the Dyeing of Furs. P. I. Chatskii. *Legkaya Prom.*, **16,** No. 12, 30–34 (1956); *Chem. Abstr.*, **51,** 13443*i*.

Objective Method for the Determination of the Degree of Liming of Gelatin Stock. R. V. Gorodetskaya, M. S. Shakhnazarova, M. V. Sheremet, D. I. Virnik, V. E. Smirnova, and R. Esakova. *Trudy Vsesoyuz. Nauch.-Issledovatel. Inst. Myasnoi Prom.*, **1955,** No. 7, 114–22. **New Method of Obtaining Technical Gelatin.** Z. V. Khokhlova and P. D. Mernenko. *Ibid.*, 123–26. **Obtaining Glue in Fine Form.** Z. V. Khokhlova and P. D. Mernenko. *Ibid.*, 127–35. **Lowering Losses in Production of Gelatin.** R. V. Gorodetskaya, M. S. Shakhnazarova, M. V. Sheremet, D. I. Virnik, V. E. Smirnova, and R. Esakova. *Ibid.*, **1956,** No. 7, 108–13; *Chem. Abstr.*, **51,** 13444*b*.

The Structure, Aging, and Rejuvenation of Collagen Fibers. I. Banga, J. Balo, and D. Szabo. *Experientia*, Suppl. No. **4,** 35–41 (1956); *Chem. Abstr.*, **51,** 13002*h*.

Aging of Collagen Fibers. F. Verzar. *Experientia*, Suppl. No. **4**, 35–41 (1956); *Chem. Abstr.*, **51**, 13003*b*.

The Connective Tissue System. R. E. Tunbridge. *Ann. Rheumatic Diseases*, **16**, 6–15 (1957); *Chem. Abstr.*, **51**, 13028*a*.

Enzymic Elucidation of the Relation between Collagen and Elastin; and Electron-microscopic Study. M. K. Keech and R. Reed. *Ann. Rheumatic Diseases*, **16**, 35–62 (1957); *Chem. Abstr.*, **51**, 13028*b*.

Preparation of Tanning Materials from AS Lignin. J. Wolf. *Sbornik Vyzkumnych praci z oboru celulosy a papiru*, **1**, 206–16 (1956); *Chem. Abstr.*, **51**, 13388*g*.

Sheepskin Detergents in Sheepskin Scouring. F. G. Edis-Bates and R. C. Tarring. *Congr. Mondial Detergence et Prod. Tensio-actifs, 1^e Congr., Paris*, **2**, Sect. 5–11, 562–63 (1954) (pub. 1956); *Chem. Abstr.*, **51**, 13433*g*.

The Analysis of Spent Tannery Liquors by Means of Paper Chromatography. A. A. Denisova. *Legkaya Prom.*, **16**, No. 12, 38–40 (1956); *Chem. Abstr.*, **51**, 13436*d*.

BOOK REVIEW

The Chemistry of the Vegetable Tannins. A Symposium. Society of Leather Trades' Chemists, Croydon, England. 1956. 160 pp. Price: 30 shillings. —This is a collection of 12 papers presented at a symposium held at Cambridge University, April 12–13, 1956. As the title indicates, this conference was concerned with the chemistry of the tannins and related compounds rather than with their use in making leather. A list of the papers follows:

"The Scope of Vegetable Tannin Chemistry". Theodore White.

"The Quantitative Determination of Specific Nuclei and Components of Vegetable Tannin Extracts". H. G. C. King and T. White.

"The Gallotannins and Ellagitannins". D. Burton and H. E. Nursten.

"The Constitution of Chebulinic Acid". O. T. Schmidt.

"The Polyphenols and Polyphenolase of Tobacco". W. W. Reid.

"Paper Chromatography as an Aid to the Elucidation of the Structure of Polyphenols Occurring in Tea". E. A. H. Roberts.

"Leuco-Anthocyanins". T. Swain and E. C. Bate-Smith.

"Leuco-anthocyanins as the Possible Precursors of Tannins". W. E. Hillis.

"Catechins from the Bark of Oak and Sweet Chestnut". W. Meyer.

"Dihydroflavonols: Their Occurrence and Properties". J. E. Gowan, E. M. Philbin, and T. S. Wheeler.

"The Stereochemistry of the Chromans and Related Compounds". W. B. Whalley.

It will be evident from these titles that a majority of the papers in this collection are of immediate interest only to organic chemists who are endeavoring to determine the structure of the tannins and the manner in which they are synthesized in living plants. But this is by no means true of all. This reviewer was most intrigued by Dr. White's opening paper, which certainly will interest everyone who has even a casual interest in the chemistry of the tannins. White

defines "tannins" as those vegetable materials capable of converting skin to leather—a definition that would exclude many plant polyphenols of relatively low molecular weight that give many of the reactions of tannins and are called tannins by botanists. The presence of such compounds (simple phenols, catechins, leuco-anthocyanidins, etc.) along with tannins in plant extracts "may indicate the type of aromatic nuclei and the pattern of phenolic hydroxylation a particular species of plant happens to employ. It is dangerous . . . . to claim that particular carbon skeletons must occur in particular groups of tannins simply because those structures characterize some of the smaller phenolic molecules present in the same extracts." Tannins, according to White, are polyphenols that are large enough to cross-link collagen and small enough to penetrate hide. The molecular weights of compounds fulfilling these requirements are from about 600 to 2000. In the hydrolyzable tannins the minimum molecular weight is attained by means of one particular structural device—the union of several polyphenols through a carbohydrate molecule—, but the idea that all condensed tannins have a common structural basis ought to be discarded. Tannins from different sources differ both with respect to their primary polyphenol units and the type of linkage. In fact, a single extract may, and probably does, contain several different tannins. Recent work on the gallotannins (King and others) and on the ellagitannins (Schmidt) has shown that the classical picture drawn by Emil Fischer is much too simple. For example, Chinese gallotannin extract (supposed to be penta-*m*-digalloyl glucose) contains about 2% of pentagalloyl glucose and 70% of the classic "gallotannin". The latter contains only 4 to 5 galloyl groups per hexose molecule and may be a galloylated trisaccharide. As to the structure of the condensed tannins, Freudenberg's catechin hypothesis may be valid for gambier and Burma cutch, and the leuco-anthocyanidin hypothesis may be valid for the eucalypti and mangroves, but neither is believed to apply to wattle or to quebracho. In discussing the physical chemistry of the tannins White points out the great need for quantitative data as to particle size, charge on particles, hydration, etc. At present it is an open question whether the condensed tannins really exist, as supposed, in the form of charged colloidal particles. The position is enormously complicated by the mutual solubilization characteristic of the behavior of tannin extract solutions. So important is this factor, coupled with the similar effects of nontannins, that, as one participant in the symposium remarked, "Pure tannin probably could not tan hide and therefore would not be a tannin at all, according to Dr. White's definition".

Other papers, of more restricted scope but reporting distinct contributions to our knowledge of the make-up of commercial tannins, include Burton and Nursten's work on the tanning and nontanning acid and salt constituents of the ellagitannins; Schmidt's progress report on the structure of chebulinic acid, a constituent of myrobalans; and the work of Hillis on the leuco-anthocyanins, shown to be obtainable in large quantities from tanning materials that produce objectionably red leather.

The value of this book is enhanced by the large number of references to the literature that most of the papers contain. White's paper alone has 84 references. The book will be indispensible to anyone seriously interested in the organic chemistry of the tannins and will interest anyone with even a casual curiosity regarding the nature of these important materials. H.B.M.

The Keys to Quality

From rugged sole leather to the soft, luxurious leather for gloves, Nopco tanning products insure such characteristics as uniformity, pliability, strength, softness and durability.

For detailed information about Nopco chemical products, plus Nopco research facilities, available to you, simply write to the Tanning Oil Division or consult with the Nopco technical service representative in your area.

Nopco chemicals for the leather industry include:

- Anti-Oxidant and Masking Agents
- Emulsifiers and Penetrants
- Fat Liquors
- Degreasing Agents
- Sponging Compounds
- Specialty Items

NOPCO **VITAL INGREDIENTS FOR VITAL INDUSTRIES**

NOPCO CHEMICAL COMPANY, HARRISON, N.J.

PLANTS: *Harrison, N.J.* • *Cedartown, Ga.* • *Richmond, Calif.* • *London, Canada*

BIOBATE

- biobate is a highly standardized bating compound of extreme stability.
- biobate provides controlled, effective enzyme action during bating for all types of leather.
- biobate is adaptable to all bating conditions and procedures.

SEBACOL

- **for dependable unhairing**
  sebacol produces clean, uniform quality leather under varied beamhouse practices.

STEROZOL

- **reliable germicide**
  sterozol inhibits bacterial action and mold growth on raw stock and leather in process.

WALLERSTEIN COMPANY, INC. • 180 MADISON AVENUE, NEW YORK 16, N.Y.

The Reader Comes First

LEATHER and SHOES believes in the "Golden Rule" of journalism --serves its readers first. It has no "sacred cows" nor prejudices.

Because of this, it is first choice of the industry's key executives. L&S is the most widely read and quoted paper in its field, and leads in paid (audited) circulation, subscription and advertising receipts.

Readers and advertisers benefit most by this policy. That's why its subscription list and advertising indexes read like the Who's Who of the industry.

LEATHER and SHOES

THE MAGAZINE FOR EXECUTIVES

300 West Adams Street
CHICAGO 6, ILLINOIS

you can't beat our

SODIUM SULPHIDE

or

SODIUM SULPHYDRATE FLAKES

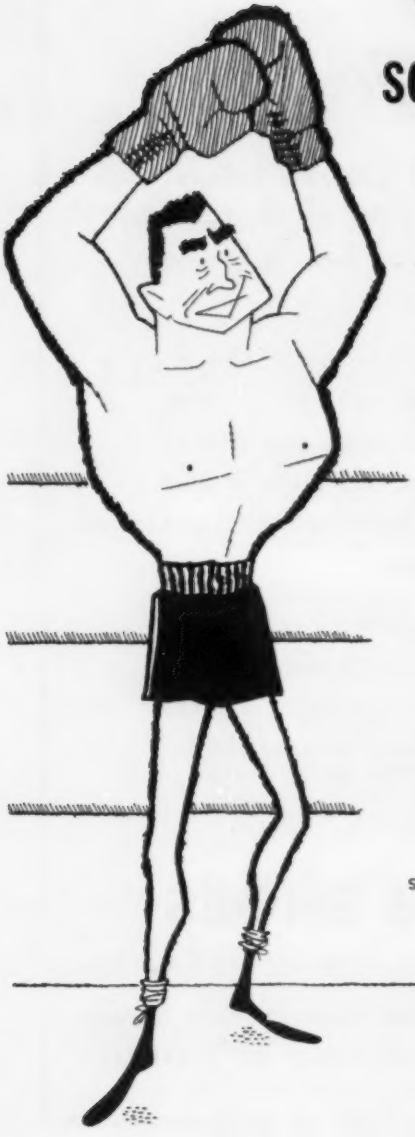
for Unhairing Qualities

KNOCKDOWN

your soaking time with our

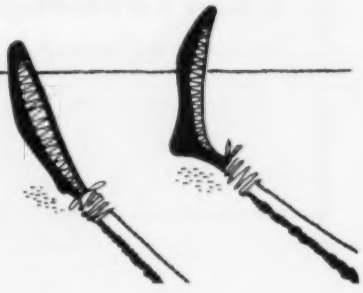
SODIUM TETRASULPHIDE

and get more uniform quality -- higher yield



BARIUM REDUCTION CORPORATION

SOUTH CHARLESTON, WEST VIRGINIA



DIAMOND A COMPOUND

TESTED and proved for 40 years—Diamond A is recognized as the Tanners' standard sponging and washing compound.

Here's why. Diamond A does a *double* job — (1) It prepares sole leather for rolling and protects the grain. (2) Used as a dip after rolling, it toughens the grain and improves color and finish.

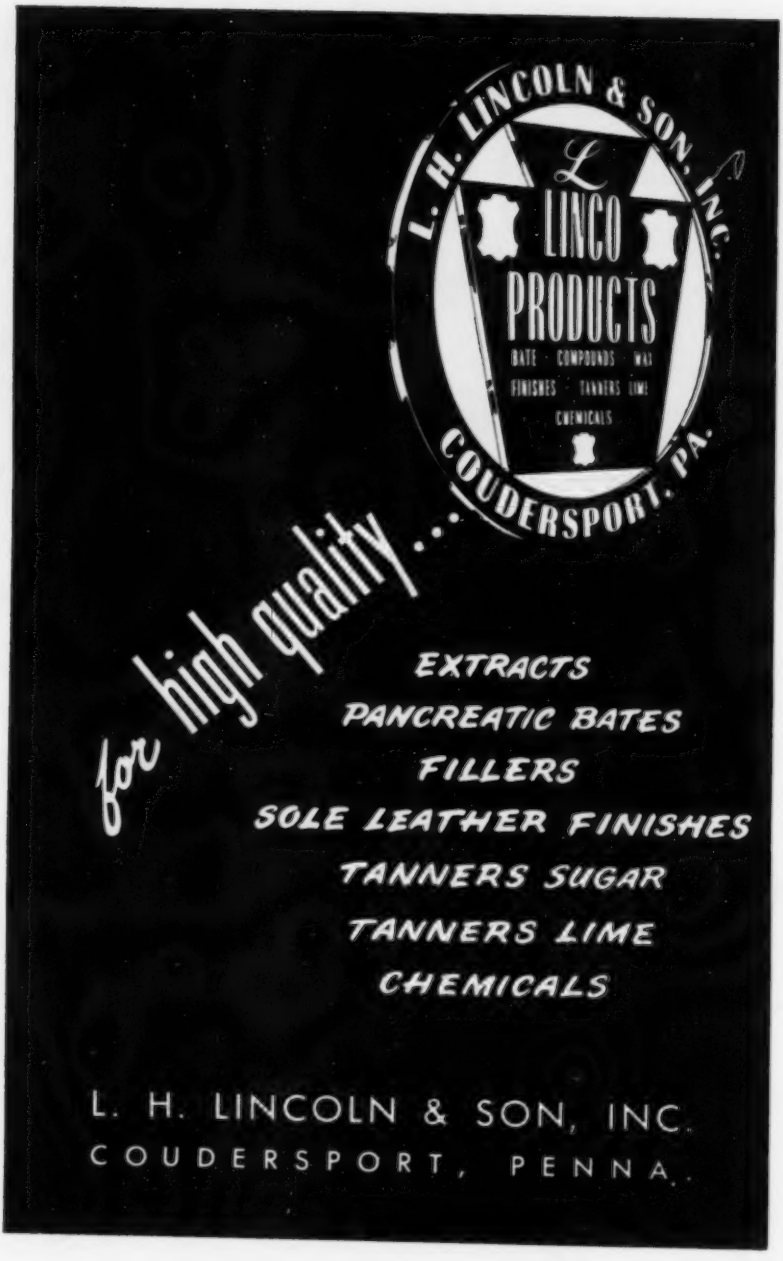
Why delay? Let the Borne Chemical representative give you full particulars on Diamond A. You'll agree it's in a class by itself.

OTHER BORNE CHEMICAL SPECIALTIES
(Get the Facts about These, Too!)
P COMPOUND for WHEELING
A COMPOUND for SPONGING
Supreme A Compound
Bretolene • Saxon Oil

BORNE SCRYMSER Since 1874

Our Laboratory Facilities are always at your disposal

BORNE CHEMICAL COMPANY, INC.
ELIZABETH, N. J. • CHARLOTTE, N. C.
Formerly BORNE, SCRYMSER COMPANY


L. H. LINCOLN & SON, INC.
LINCO
PRODUCTS
COUDERSPORT, PA.
for high quality . . .
EXTRACTS
PANCREATIC BATES
FILLERS
SOLE LEATHER FINISHES
TANNERS SUGAR
TANNERS LIME
CHEMICALS
L. H. LINCOLN & SON, INC.
COUDERSPORT, PENNA.

LEATHER STRENGTH AND TEMPER ASSURED

Sun Leather Process Oils are sure aids to uniform leather strength, suppleness and durability...and you can get these fine qualities in less processing time! Numerous tanners and finishers confirm the fast action of Sun Leather Process Oils. They mix easily, penetrate quickly and provide uniform fiber lubrication. Since they form no surface scum, tannage is thorough and even.

For information about Sun Leather Process Oils, call your nearest Sun representative or write to...

INDUSTRIAL PRODUCTS DEPARTMENT

SUNOCO

SUN OIL COMPANY

PHILA. 3, PA. • SUN OIL COMPANY LIMITED, TORONTO & MONTREAL

© Sun Oil Company

EISENDRATH FINE CALF LEATHERS

IN COLORS AND BLACK

B. D. Eisendrath Tanning Company

RACINE, WISCONSIN

92 South St., Boston, Mass., Day Gormley Leather Co. 29 W. 36th St., New York City, Eugene Williams
1358 S. Hill St., Los Angeles 15, Calif., David V. Whiting Co.

THE OHIO LEATHER CO.

Quality Calf Leather

LUXOR - BLACK JETTA
KAFFORITE - KOZY - JILL JETTA
EMBOSSED CALF - WHITE WASHETTE

TANNERY AND GENERAL OFFICES:
GIRARD, OHIO
BOSTON - NEW YORK - ST. LOUIS - CHICAGO

THE ORTHMANN LABORATORIES INC.

AUG. C. ORTHMANN, Pres.

Consulting, Analytical and Research Chemists

407 E. MICH., MILWAUKEE, WIS.
Phone: BROADWAY 6-6426-27

CALOPHYL C-10

- Penetrates to the center, exhausting the fat liquor with it.
- Adds weight and plumpness. Does not lay on surface or wash out.
- Dissolves instantly in tap water.
- Compatible over a wide pH range.
- ALSO excellent as a sealer in the base coat and for grinding pigments.

APEX CHEMICAL CO. INC.

Manufacturers since 1900

200 South First St. Elizabethport 1, N. J.

LEATHER
YESTERDAY - TODAY - ALWAYS!

QUALITY EXTRACTS
FOR SEVENTY YEARS

AMEREX PRODUCTS

DERMABATE

LIQUID VEGETABLE EXTRACT BLENDS

Every Type of Extract
for each individual tannery need

ALL OUR BLENDS CONSIST OF
ONLY PURE VEGETABLE EXTRACTS

AMERICAN EXTRACT CO.
PORT ALLEGANY, PA.

Manufacturers of the Largest Variety of
Vegetable Tanning Extracts made in U. S. A.
from Domestic and Foreign Barks

BARRENTAN

B

TESTING AND RESEARCH
CORPORATION
PORT ALLEGANY, PENNA.
ESTABLISHED 1950

PROGRESS WITH LEATHER through BARRENTAN

Compounds - Chemicals - Powdered Tanning Materials
Aldehyde Resins - Wheeling Resins

1-2-3

MORITE BRAND

Sulphonated and Compounded

OILS

EST. 1908 EST. 1908

WHITTEMORE-WRIGHT COMPANY, INC.

62 ALFORD ST. CHARLESTOWN DISTRICT BOSTON, MASS.

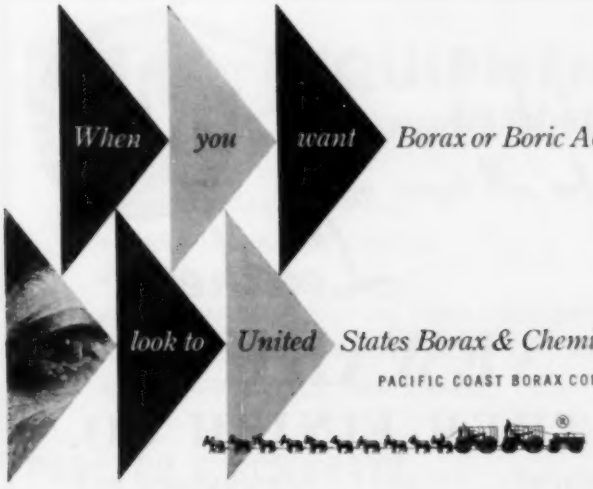
PRESTO

The Original Dry Color
for Splits and Suede
(also in paste form)

PRESTO COLOR COMPANY

WEST ALLIS 14, WIS.

Dry Colors ❖ ❖ Finishes



LEATHER and TANNING MATERIALS

CONSULTING • TESTING • RESEARCH • DEVELOPMENT
for the
TANNING AND ALLIED INDUSTRIES

Specialists: Sampling and Testing of Tanning Materials

UNITED STATES TESTING COMPANY
INCORPORATED
1950 Park Avenue, Hoboken, N. J.

Finishes
for all types of
Leather

FINE LEATHER FINISHES NLF

NEWARK
LEATHER FINISH CO.

8 WILHELM ST. HARRISON, N. J.
Telephone HUmboldt 2-5072

CONSULTING SERVICE

Technical consultation is available for improving your leather, reducing your costs and developing new leathers and finishes. More than 40 years practical application of Scientific Research to Leather manufacturing.

ADOLF SCHUBERT, 549 W. Washington Blvd., CHICAGO, ILL.

by

THE AULSON *Tanning Machinery Co.*

Main Office and Factories at Beverly, Mass. ★ Branch Office under direction of E. R. Aulson, Waukegan, Ill.

Proctor **EQUIPMENT** for the **TANNING INDUSTRY**

- ROTO-SPRAY (4 or 8 Gun)
- PASTED LEATHER DRYERS
- TOGGLE DRYERS
- POLE AND HOOK TYPE CONVEYOR DRYERS
- SEASONED SKIN AND SPRAYED FINISH DRYERS
- WASHED CATTLE HAIR DRYERS

PROCTOR & SCHWARTZ, INC. Philadelphia 20, Pa.

LUCIEN BUCK EXCLUSIVE SALES REPRESENTATIVE FOR THE LEATHER INDUSTRY

Always Foremost

Armour's QUALITY Leathers USA

SOLE and UPPER LEATHER

●

ARMOUR LEATHER CO.

Chicago Boston New York

NEW CHROMIUM COMPOUNDS

for the Progressive

TANNING CHEMIST

NUCHROME

Pure Basic Chromic Sulfate. No impurities, no sodium, aluminum or other salts.

DRY (35% Cr_2O_3)

LIQUID (25% Cr_2O_3)

CHROMIC CHLORIDE
CHROMIC ACETATE
CHROMIC FORMATE
CHROME ALUM AND OTHERS

FIBER CHEMICAL CORPORATION

P. O. BOX 218 MATAWAN, N. J.

REILLY-
WHITEMAN-
WALTON CO.

CONSHOHOCKEN, PA.

THE LEATHER MANUFACTURER

ESTABLISHED 1883

Exclusively a Tannery Paper

Devoted to Leather Technology, Tanning and Finishing of Leather, Tannery News and Markets.

Affords complete tannery coverage, concentrated among tanners, chemists and buyers of materials, raw stock and equipment.

Technical articles and newsworthy features invited for publication.

THE LEATHER MANUFACTURER

NEW YORK OFFICE
154 Nassau St.

BOSTON OFFICE
683 Atlantic Ave.

BONA ALLEN, INC.

Buford, Georgia

TANNERS SINCE 1873

•

Finest English Rein
and Strap Leather

Latigotan Harness Leather

Manufacturers of genuine English type and full rigged hand tooled roping saddles.

HOWES LEATHER CO. INC.

SOLE LEATHER

•

SIDE LEATHER

•

Tanners Cut Sole Division

•

CUT SOLES

BOSTON, MASS.
ST. LOUIS, MO. CHICAGO, ILL.

two good steps . .

. . . essential to the production of fine leathers are: first, selection of good hides and skins and, second, selection of quality tanning materials.

For years, tanners have selected Clinton corn sugars and Clinton corn syrups as proven materials to use in the chrome tanning process. Clinton Lactic Acid, available in concentrations of 44% or higher, is used as an outstanding deliming and finishing agent.

We know you've already taken the first wise step — selection of good hides. Why not follow up with the second . . . if you haven't already done so? Always choose Clinton for your tanners' sugars, syrups and lactic acid requirements.

Quality products
FROM THE WORLD'S CORN CENTER
CLINTON
CLINTON CORN PROCESSING COMPANY
CLINTON, IOWA

Warner

BELL-MINE LIME

Accurate laboratory control assures you of consistently better milk of lime.

You can depend on Warner Bell-Mine Lime for uniform purity, analysis and physical properties.

WARNER COMPANY, Bellefonte Division, Bellefonte, Pa.
Philadelphia Pittsburgh

Mardol TANNERY OILS

TANNERY OILS
AND FAT LIQUORS
FOR ALL TYPES OF LEATHER

MARDEN-WILD CORPORATION
500 COLUMBIA STREET, SOMERVILLE, MASS.
MARDEN-WILD OF CANADA LTD., HALIFAX, N. S.

Salem Oil & Grease Co.

FAT LIQUORS
FEATURING
CONTROLLED PENETRATION

•

SALEM, MASSACHUSETTS

"ADE II AN" LIQUID QUEBRACHO FILADE
GAMBADE EXTRACT DRIPASTE

THE TANNADE COMPANY
2136 DOMINICK ST., CHICAGO, ILLINOIS

BORNEO CUTCH EXTRACT
(MANGROVE BARK EXTRACT)

SAXE CUTCH CORPORATION
500 FIFTH AVE., NEW YORK 36, N.Y.

E. F. DREW & CO., INC.
BOONTON, N. J.
MANUFACTURERS OF
LEATHER OIL PRODUCTS

CALGON® PRE-TAN CUTS TANNING TIME

Calgon Pre-Tan before vegetable tanning speeds up penetration of vegetable liquors, requiring ¼ to ⅓ the time needed by ordinary methods

In addition to being a big time saver, Calgon Pre-Tan produces high quality leather. Because of the unique properties of Calgon you get leather with exceptional freedom from stains, light uniform color, dense grain structure, and a long silky fiber which contributes greatly to tensile strength. Calgon Pre-Tan makes plumper leather, better for embossing processes. Calgon Pre-Tan makes better, finer, more beautiful leather. Write for your free copy of "Calgon Data for the Leather Chemist."

CALGON COMPANY
DIVISION OF HAGAN CHEMICALS & CONTROLS, INC.
HAGAN BUILDING, PITTSBURGH 30, PENNSYLVANIA
DIVISIONS: CALGON COMPANY, HALL LABORATORIES
IN CANADA: HAGAN CORPORATION (CANADA) LIMITED, TORONTO

finest products fastest service

EST. 1924

TANNING EXTRACTS
SULFONATED OILS
STUFFING GREASES
LIGNOSULFONATES

ARTHUR C. TRASK CO.

- CABLE: Actrask
- TELETYPE: CG1478

327 So. La Salle St. Chicago 4, WAbash 2-8900
55 W. 42nd St. New York 36, LOngacre 4-8489

STANDARD HIDE POWDER

A material made to specifications and used internationally for the analysis of vegetable tanning materials

FRANK F. MARSHALL
RIDGWAY · PENNSYLVANIA

KEPEC FINISHES · KCC CHEMICALS

KEPECO EMULLO FINNALINE KEEPA-SHINE UNI-LAK (Reg. U. S. Pat. Office) KEPOLAC FONDO

KEPEC CHEMICAL CORPORATION
MILWAUKEE 1, WISCONSIN

Garden State Tanning Inc.
Pine Grove, Pa.

Manufacturers of
Upholstery Leather

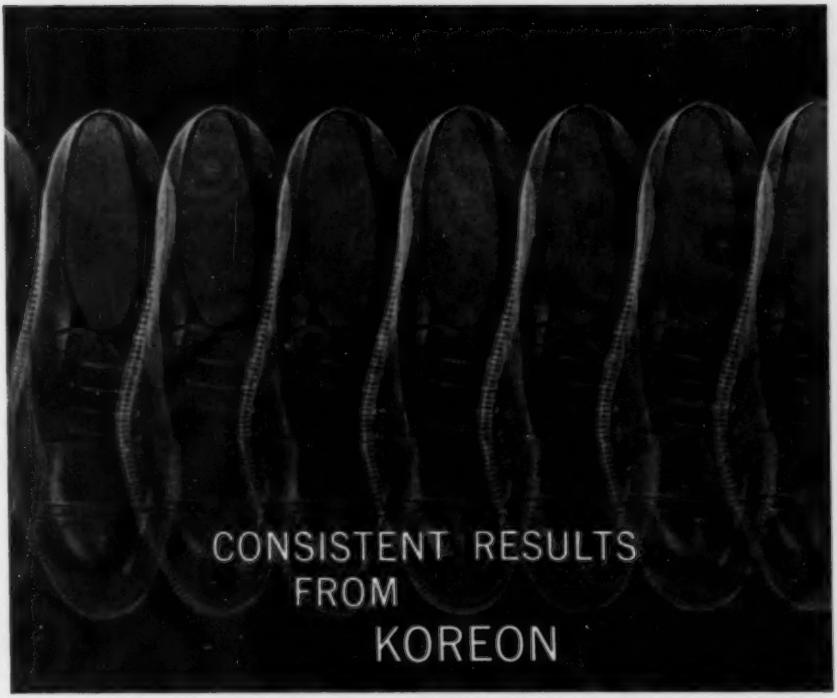
New York Office **330 Fifth Avenue**

"The Extension of Knowledge is by the Investigation of Matter".

This space dedicated to
Tanner's Council Research Laboratory
by a Friend

INDEX TO ADVERTISERS

ADOLF SCHUBERT XXIX
AMERICAN CYANAMID COMPANY, Dyestuff Department XIII
AMERICAN EXTRACT CO. XXVI
ANTARA CHEMICALS XVII
APEX CHEMICAL CO., INC. XXVI
ARKANSAS COMPANY, INC. VI
ARMOUR LEATHER CO. XXX
ARTHUR C. TRASK CO. XXXV
ARTHUR THOMAS CO. XVIII
ATLAS REFINERY XII
AULSON TANNING MACHINERY CO., THE XXIX
BARKEY IMPORTING CO., INC. X
BARRENTAN CORPORATION XXVI
BARIUM REDUCTION CORPORATION XXII
BONA ALLEN, INC. XXXII
BORNE CHEMICAL COMPANY, INC. XXIII
BUCKMAN LABORATORIES, INC. IV
CHEMTAN COMPANY ..... Outside Back Cover
CLINTON CORN PROCESSING COMPANY XXXII
DIAMOND ALKALI CO. V
E. F. DREW & CO., INC. XXXIV
EISENDRATH TANNING CO. XXV
FIBER CHEMICAL CORPORATION XXX
FRANK F. MARSHALL XXXV
GARDEN STATE TANNING, INC. XXXV
GEIGY COMPANY, INC. IX
HAGAN CHEMICALS & CONTROLS, INC. XXXIV
HOOKER ELECTROCHEMICAL CO. XI
HOWES LEATHER CO., INC. XXXII
INTERNATIONAL SALT CO., INC. XVI
KEPEC CHEMICAL CORPORATION XXXV
LEATHER AND SHOES XXI
LEATHER MANUFACTURER, THE XXXI
L. H. LINCOLN & SON, INC. XXIV
MARDEN-WILD CORPORATION XXXIII
MUTUAL CHROMIUM CHEMICALS, ALLIED CHEMICAL & DYE CORP. ..... Inside Back Cover
NEWARK LEATHER FINISH CO. XXVIII
NOPCO CHEMICAL CO. XIX
OHIO LEATHER CO., THE XXV
OLSON IMPORTING COMPANY, INC., THE ..... Inside Front Cover
ORTHMANN LABORATORIES, INC., THE XXV
PRESTO COLOR CO. XXVII
PROCTOR AND SCHWARTZ, INC. XXIX
REILLY-WHITEMAN-WALTON CO. XXXI
ROBESON PROCESS CO. II
ROHM & HAAS VIII
SALEM OIL & GREASE CO. XXXIII
SAXE CUTCH CORPORATION XXXIV
SOLVAY PROCESS DIVISION, ALLIED CHEMICAL & DYE CORP. XV
SUN OIL COMPANY XXV
TANIMEX CORPORATION III
TANNADE COMPANY XXXIV
TANNER'S COUNCIL RESEARCH LABORATORY XXXV
UNITED STATES BORAX & CHEMICAL CORP. XXVII
UNITED STATES TESTING COMPANY XXVIII
WALLERSTEIN COMPANY, INC. XX
WARNER CO. XXXIII
WHITTEMORE-WRIGHT CO. XXVII
WOLF, JACQUES & CO. VII
YOUNG CO., J. S. XIV



. . . consistent one-bath chrome tan

MUTUAL

Sodium Bichromate
Sodium Chromate
Chromic Acid
Potassium Bichromate
Potassium Chromate
Ammonium Bichromate

Constant composition, uniform basicity, unvarying purity over the years are the reasons why tanners have purchased Mutual's KOREON for over three decades.

Because your procedure must be the same every time you tan a hide—to keep production problems low and product uniformity high—your tanning agent, too, must be the same every time. KOREON answers this need.

This dependable one-bath chrome tan comes in two basicities—KOREON M at 33-35% and KOREON X at 50-52%.

Send for literature or ask a Mutual salesman to call. Remember, too, that technical service based on over three decades of experience is available when you need it.

If you want to prepare your own one-bath chrome tan, Mutual can provide the technical aid and the principal raw material — Sodium Bichromate.

Mutual Chromium Chemicals

Allied Chemical

SOLVAY PROCESS DIVISION • 61 BROADWAY, NEW YORK 6, N. Y.

DEPT. L2-5-1 • MUTUAL CHROMIUM CHEMICALS • SOLVAY PROCESS DIVISION

Allied Chemical & Dye Corporation
61 Broadway, New York 6, N. Y.

Please send:

☐ booklet "KOREON — One-bath Chrome Tan for Leather"

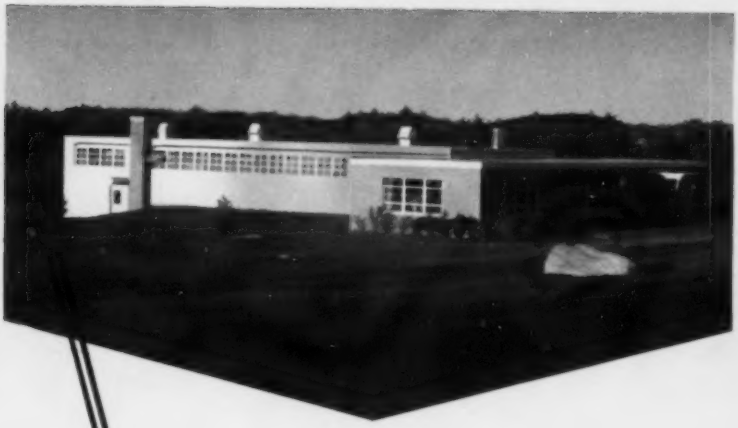
☐ have salesman call

Name_____ Position_____

Company_____

Street_____

City_____ Zone____ State_____



Come and visit our new home . . .

It's only one hour from Boston. Its equipment and atmosphere are designed to facilitate development work on better chemicals for better leathers.

CHEMTAN COMPANY
EXETER, NEW HAMPSHIRE

All our facilities are devoted exclusively to the tanning industry.